

Fishery Data Series No. 91-34

**Summary of Recaptures of Arctic Grayling Tagged in
the Middle Tanana River Drainage, 1977 through
1990**

by

William P. Ridder

August 1991

Alaska Department of Fish and Game

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ABSTRACT

From 1977 through 1990, approximately 3,800 recoveries of tagged Arctic grayling *Thymallus arcticus* were used to summarize the seasonal movements of Arctic grayling in the middle Tanana River drainage. These recoveries came from a release of approximately 19,000 fish that were tagged in 13 different locations, encompassing silted rapid run-off, unsilted rapid run-off, spring-fed, and bog-fed systems. Trends in movement indicate a migration from spawning areas in unsilted rapid run-off and bog-fed systems to spring-fed systems for feeding. Major systems of migration include: from Caribou Creek to the Richardson Clearwater; and, from the Goodpaster and Volkmar Rivers to the Delta Clearwater River. Recovery data also indicate a high degree of specificity to feeding areas, especially to the Delta and Richardson Clearwater rivers.

KEY WORDS: Arctic grayling, *Thymallus arcticus*, movements, migrations, spawning, homing, recapture histories, middle Tanana River drainage, Alaska.

INTRODUCTION

The first Alaskan studies of Arctic grayling (hereafter called grayling), *Thymallus arcticus*, were initiated in the Tanana River drainage by the United States Fish and Wildlife Service (USFWS) in 1952. There have been four investigations of the movement patterns of grayling since the initial study. These were included in studies centered in the mid-Tanana drainage within 30 km of Delta Junction (Figure 1). The three earliest studies documented several general inter- and intrastream movement patterns. The latest study described specific interstream movements between spawning and summer feeding areas. Together these studies present a picture of complex grayling life history strategies and numerous mixed stock fisheries. Recovery data and analyses presented in this report are incomplete and/or insufficient for a thorough examination of the extent and significance of interstream movements, especially those occurring between spawning and summer feeding areas. Knowledge of interstream movements is necessary to describe the grayling's life history and to structure economical research programs to accurately collect data for management needs. Complete information on numbers of grayling caught, marked, and released, sampling effort and timing, specification of recovery locations, sample sizes and compositions, and abundance and harvest estimates is lacking. No archive of these data from the earliest studies exist. Fortunately, such data from the latest study exists but is scattered in published and unpublished sources.

The purpose of this report is to compile and summarize all catch, tagging, and recovery data for grayling collected in the mid-Tanana area during the latest study period, 1977 through 1990. This report is not intended to present a complete analysis of the data but rather to provide a preliminary look at interstream movements extracted from the extensive database. This information will be a guide for future research efforts and provide access to a retrievable database for additional analysis.

BACKGROUND

The Tanana River drainage has traditionally supported the largest grayling sport harvest in Alaska. Grayling taken in the drainage comprised 48% of the total annual statewide harvest during the period 1977 through 1988 (Mills 1989). Grayling harvested within a 30 km radius of Delta Junction (Figure 1) is estimated to comprise approximately 30% of the drainage's total. There are at present three major grayling sport fisheries in the Delta Junction area and these are presented in descending order of importance: the Delta Clearwater River (DCR), the Goodpaster River (GPR), and the Richardson Clearwater River (RCR) (Table 1). Prior to 1987 and the implementation of spring closures, a major sport fishery occurred on pre-spawning adults in the Tanana River at the mouth of Shaw Creek. Lesser sport fisheries occur in early spring in the Tanana River in the vicinity of Big Delta (Big D), and during summer and fall in Shaw, Clear, and Blue creeks, Clearwater Lake, and the Volkmar River.

The grayling research program in the Delta Junction area from 1952 through 1958 emphasized the tagging of grayling in four areas and the recovery of

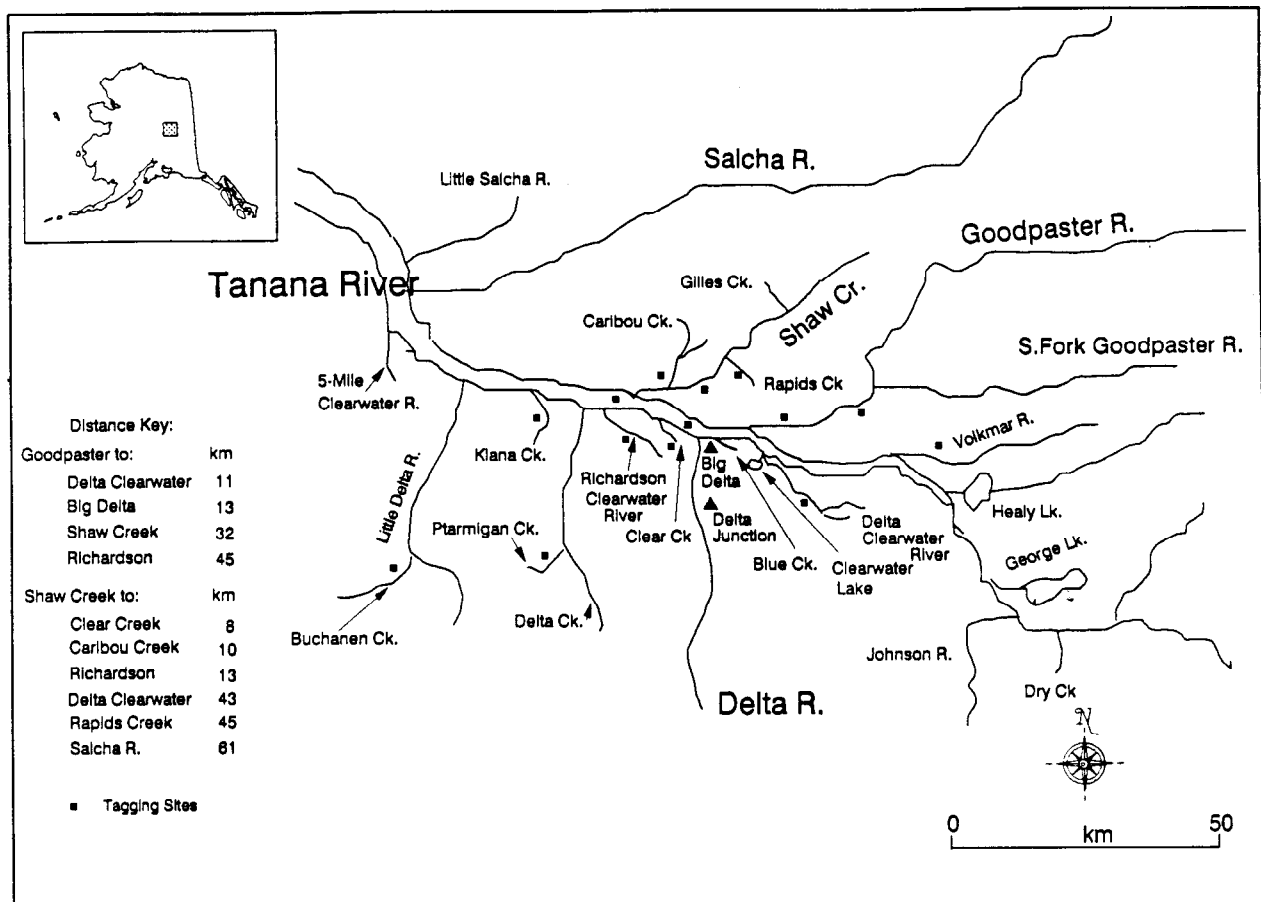


Figure 1. The middle Tanana River drainage and locations of tagging sites.

Table 1. Estimated recreational harvest of grayling in the Delta Clearwater, Goodpaster, Richardson Clearwater, and Salcha rivers and Shaw Creek, 1977 through 1989^a.

Year	Delta Clearwater	Goodpaster	Richardson	Salcha	Shaw
1977	6,118	ND ^b	ND	6,387	ND
1978	7,657	"	"	9,067	"
1979	6,492	"	"	5,980	"
1980	5,680	"	"	5,351	"
1981	7,362	"	1,562	3,983	" ^c
1982	4,779	"	1,729	6,843	"
1983	6,546	3,021	2,822	9,640	2,297
1984	4,193	1,194	1,376	13,305	2,570
1985	5,809	2,757	798	5,826	2,584 ^c
1986	2,343	1,508	827	7,540	505
1987	2,005 ^d	1,702	ND ^d	4,762	567 ^d
1988	2,910	1,273	"	2,383 ^d	NA
1989	3,016	1,964	972	5,721	411
Averages	4,993	1,917	1,441	6,676	1,489

^a Data sources: Mills (1979 - 1990).

^b ND = data not available.

^c Spring fishery closed by emergency order.

^d Special regulations went into effect: closed season from 1 April to the first Saturday in June; 12 inch (305 mm TL) minimum length limit; and, artificial lures or flies only.

tagged fish from eight areas (Table 2). This tag and recovery program was initiated to obtain knowledge of grayling movement among various fisheries. The majority of tag and recovery effort occurred in mid-summer, predominantly in the Goodpaster River and to a lesser extent in the Delta Clearwater River. In mid-summer, grayling movement is minimal (Tack 1980). Some tagging was also conducted during the spring in the Tanana River at Big Delta and at Shaw Creek. Researchers found that grayling tagged in the spring were more likely to migrate in the same year and become summer residents of the Delta and Richardson Clearwater rivers than fish tagged during mid-summer. Grayling tagged during summer in the Goodpaster River were more likely to migrate the following year, mostly to the Delta Clearwater River. The data were partially summarized by Warner (1957, 1958, 1959) and Reed (1961).

Research conducted during 1960 through 1966 emphasized the tagging of grayling between June and September in the Goodpaster, Delta Clearwater, and Richardson Clearwater rivers, and Shaw Creek (Table 2). The majority of fish were tagged in the Goodpaster and Delta Clearwater rivers. These studies documented the same interstream movements as described in previous studies, and pointed out a strong tendency for grayling to home to feeding areas in spring-fed systems (the Delta Clearwater and Richardson Clearwater rivers). Reed (1961) postulated an age-dependent relationship for movements of fish from the Goodpaster River to the Delta Clearwater River. While presenting no quantitative data, he stated that the majority of fish tagged in the Goodpaster River were ages 2 and 3, while the recaptures of these fish in the Delta Clearwater River were at age 5 and older. Nagata (1963) proposed that the Goodpaster River and Shaw Creek were nursery streams from which some grayling, after reaching a suitable size, migrated, and thus contributed to populations in other tributaries of the Tanana River. He noted that his data were not sufficiently analyzed to determine the extent of these contributions or even if these movements affected a significant proportion of the total grayling population. He recommended continuing the tagging effort with an emphasis on age and size analyses of the recoveries. A summary of numbers tagged and recoveries for each location and a brief interpretation is presented by Roguski and Schallock (1967).

Research conducted from 1970 through 1973 emphasized the tagging of grayling in the Goodpaster River from early May through September. These studies were concerned with estimates of abundance and intrastream movements. They documented upstream movements of adult and sub-adult grayling in the early spring, and a mid-summer period of stasis with larger and older fish in the upper reaches and smaller, younger fish in the lower river. A mix of ages and sizes was noted in the mid-river reach. A downstream movement involving all age classes occurred in the fall (Tack 1974).

Research conducted from 1977 through 1990 has concentrated on gaining additional movement data in the mid-Tanana drainage. Over 19,000 grayling have been tagged in 13 streams, resulting in about 3,800 tag recoveries from 17 streams. From 1977 to 1987, tagging efforts were conducted primarily during the spring in six waters when grayling movement to and from their spawning, feeding, and overwintering areas was at or near a peak (Tack 1980). These efforts were partly designed to locate spawning areas and to delineate their importance to the populations in the Delta Clearwater and Richardson

Table 2. Number of grayling tagged and recaptured in the middle Tanana River drainage, 1952 through 1958, and 1960 through 1966.

Tagging Location	Number		Recapture Locations									
			Goodpaster		Delta Clearwater		Richardson Clearwater		Shaw Creek		Other	
	Tagged	Recaptured	No.	%	No.	%	No.	%	No.	%	No.	%
1952 - 1958 ^a												
Goodpaster River	1,858	187	156	83	22	12	6	3	0	---	3 ^c	2
Delta Clearwater	213	20	0	---	16	80	1	5	1	5	2 ^d	10
Shaw Creek	74	7	0	---	2	29	1	14	4	57	0	---
Tanana River	143	9	4	44	3	33	1	11	0	---	1 ^e	---
Total	2,288	223	160		43		9		5		6	
1960 - 1966 ^b												
Goodpaster River	6,097	320	237	75	45	14	38	12	0	---		---
Delta Clearwater ^f	6,539	836	3	1	831	99	2	0	0	---		---
Richardson Clearwater	1,812	356	1	0	8	2	343	96	4	1		---
Shaw Creek	213	12	0	---	5	42	5	42	2	17		---
Total	14,661	1,524	241		889		388		6		0	

^a Data compiled by Ridder (1983). Sources of recoveries unknown.

^b From Roguski and Schallock (1967). Angler and ADFG recoveries combined. Recoveries from other locations not tabulated. See Nagata (1963) for partial listing.

^c Tanana River at Big Delta n = 2, 5 Mile Clearwater River n = 1.

^d Sam Creek and Clearwater Lake.

^e Unknown.

^f Recoveries in Delta Clearwater River include Clearwater Lake.

Clearwater rivers. Tagging was also conducted to evaluate grayling enhancement of the Delta Clearwater River. Grayling reared in ponds were tagged and stocked in the river from 1977-1978 and from 1985-1987. From 1988 to the present, tagging has been conducted in association with mid-summer abundance estimates in the Richardson Clearwater and Goodpaster rivers. Recoveries and results from these programs were presented by Ridder (1982, 1985). Ridder (1985) found that adults spawning in bog-fed streams predominantly migrated to spring-fed systems located downstream to feed for the summer. For example, Shaw Creek fish migrated to the Richardson Clearwater River, while Volkmar River fish migrated to the Delta Clearwater River. Those fish spawning in the Goodpaster River, a rapid run-off stream, moved upstream to the Delta Clearwater River, but in lesser proportions than fish migrating from the Volkmar River. Ridder (1985) found that one-third of the grayling residing in the Richardson Clearwater River during summer had originally spawned in Caribou Creek during spring. From recapture rates and results of scale pattern analysis, Ridder (1985) also found that of the Delta Clearwater River summer population, Goodpaster River fish comprised 30%, Volkmar River fish comprised 50%, and the remaining 20% came from Caribou Creek and other systems.

Tack (1980) interpreted the information collected from 1952 through 1973 and other studies, and provided a comprehensive description of seasonal grayling movements between the various stream habitats in the study area. It is the utilization of these habitats at various life stages that have allowed grayling to successfully adapt to the severe demands of the northern ecosystem. He described the four habitats as silted and unsilted rapid run-off streams, bog-fed streams, and spring-fed streams.

Site Descriptions

The Tanana, Delta, and Little Delta rivers and Delta Creek (Figure 1) are examples of silted rapid run-off streams that are clear in the winter but carry a heavy silt load from headwater glaciers for the period from mid-April through September. Grayling utilize these streams for overwintering and as a migratory pathway to and from spawning and summer feeding areas. A winter and early spring fishery presently occurs in the Tanana River in the vicinity of Big Delta and, prior to closure in 1987, at Shaw Creek. Sport harvests have ranged from an estimated 200 to 1,000 grayling annually due to variable effort and weather conditions between years. The composition of the harvest varies with time; adults are predominant until mid-March while sub-adults make up the majority of the harvest for the remainder of the season.

The Goodpaster and Salcha rivers are two examples of unsilted rapid run-off rivers that arise in the uplands north of the Tanana River (Figure 1). They are typically clear except during periods of high discharge arising from run-off during spring or heavy rains during summer and fall. Water temperatures range from 0°C to 15°C. Grayling utilize these larger systems, either the mainstem and/or tributaries, for spawning, rearing, and summer feeding. Grayling also use the lower reaches of these rivers for overwintering. The Salcha River drains a larger area, is accessible by road at its lower end, and has an average annual harvest of 6,600 grayling. The Goodpaster River is accessible only by boat or plane and has an average annual harvest of 1,900

grayling. Recreational fisheries occur from ice-out in mid-May, through September. Clark and Ridder (1990) provide a more thorough description of these rivers as well as all historical data on abundances and age and size compositions of their grayling populations.

Little is known of grayling that use the smaller unsilted rapid run-off streams. These streams include Buchanen, Ptarmigan, Gilles, and Dry creeks, which are tributaries to, respectively, the Little Delta River, Delta Creek, Shaw Creek, and the Tanana River (Figure 1). Buchanen Creek is largely inaccessible, with access limited to airplane and then an overland hike. The fishery largely consists of harvests by a few guided moose and caribou hunters in the fall. Ptarmigan Creek is accessed by plane via a landing strip at its mouth, and has a small fishery similar to that of Buchanen Creek. Gilles Creek is accessible only by helicopter and has no sport fishery. Dry Creek is accessible by highway along the lower reaches and by private roads in the middle reaches. Local residents participate in the fishery at Dry Creek, which is small and limited to the upper reaches. The lower portion of Dry Creek is intermittent and flows only during spring run-off or heavy rains.

Bog-fed streams drain flat swampy country, with most of their discharge occurring from surface run-off. They are typically of uniform depth, predominantly with a mud/silt substrate, and a brown-stained color produced from tannins. High stream flows, while still producing high and turbid water, are buffered by the swamps and low flow rate through bogs. Bog-fed streams typically freeze solid during winter, and experience high temperatures in the summer (17-20°C). Grayling use these systems for spawning, rearing, and summer feeding. Examples include Shaw Creek, its tributaries Caribou and Rapids creeks, the Volkmar and Little Salcha rivers, and Kiana Creek (Figure 1). Shaw Creek is the largest of these systems and is paralleled by a road along the lower 1 km of river. Boat access above river kilometer 10 is restricted due to numerous deadfalls. The fishery had an annual harvest of 2,500 grayling prior to restrictive regulations initiated in 1987. Since then, harvest has averaged 500 grayling annually (Table 1). The Volkmar River is accessible only by boat via the Tanana River and access is limited to the lower 6 km of river. It has an annual harvest of less than 300 fish. The Little Salcha River is accessible only at a highway bridge at river kilometer 2. Its small size limits access to non-motorized boats. A small fishery exists, with a harvest of a few hundred grayling annually. Caribou and Rapids creeks are located 10 and 45 km, respectively, from the mouth of Shaw Creek. Only a handful of anglers fish Caribou Creek and less fishing occurs at Rapids Creek. Kiana Creek, 37 km below Shaw Creek, is accessed only by boat and has virtually no fishery.

Spring-fed systems are generally small (less than 40 km in length) and arise exclusively from springs on the south side of the Tanana River drainage. They are characterized by constant discharge and very clear water that tends to be basic and of high alkalinity. Summer water temperatures are low compared to other stream types, rarely exceeding 8°C. They seldom experience ice in winter or high discharges from spring runoff and storms. Grayling utilize spring-fed systems strictly as summer feeding areas, with no spawning or overwintering use. Juveniles and sub-adults first immigrate to these systems in mid-April and are followed by adults in mid-May. Outmigration can begin in

August and last through November. Examples include, by decreasing stream length, the Delta, Richardson, and 5-Mile Clearwater rivers, and Clear and Blue creeks (Figure 1). Harvests in all systems are of predominantly adult-size fish (>270 mm FL). The Delta Clearwater River averages an annual harvest of 5,000 fish; the Richardson Clearwater River averages 1,400 fish; 5-Mile Clearwater River averages less than 500 fish; Clear Creek averages less than 200 fish; and Blue Creek averages less than 100 fish.

METHODS

The 14 years of summary data presented in this report were originally archived in a number of different formats: field notebooks, office files, published reports by the Alaska Department of Fish and Game (ADFG), and computer files. The different methods of data storage made access especially cumbersome considering the volume of the data base (in excess of 55,000 records). Thus, all data files were transformed from existing computer files or transcribed from hard copy either through optical scanning forms or by hand into standardized ASCII computer files. The editing of these files elucidated many irregularities, especially in numbers of tagged fish actually released. Thus, the data presented in this report should supersede any previously published summaries of Arctic grayling migrations in the mid-Tanana River drainage.

The 70 ASCII files comprising the data base are archived at the offices of ADFG, Sport Fish Division's Research and Technical Services in Anchorage (Appendix A1). Exceptions to these archives are the June mark/recapture experiments in the Goodpaster River from 1977 through 1985, population sampling of the 5-Mile Clearwater River in 1980 and 1983, and the April in-migration sampling in the Delta Clearwater River from 1977 through 1982. In these events, only data referencing recoveries of marked fish were transcribed. Sample sizes and length frequency data were obtained directly from published reports and office files.

All marking of fish was done with individually numbered (five digits) Floy internal anchor tags (model FD 67) in one of five colors (white, yellow, blue, red, or green). Tags also carried one of two legends: from 1977 through 1986, RTN ADF&G FBKS; from 1987 on, ADF&G FBKS. (These are common acronyms for the Alaska Department of Fish and Game and the city of Fairbanks.) Tags were applied along the left base of the posterior half of the dorsal fin. Date, location, gear type, fork length to the nearest 1 mm, sex, fate, tag number and color, and fin clip (if any) were recorded for each tagged fish on either coin envelopes (when scale samples were taken), field forms, field notebooks, or optical scanning (mark/sense) forms. Exceptions were those fish stocked into the Delta Clearwater River from 1979 through 1985 which were batch marked and sub-sampled for lengths (Ridder 1985, Holmes, et al. 1986). All fish tagged during a specific event in a specific location are referred to as a "tagging cohort", or simply a "cohort". The terms "recapture" and "recovery" are used interchangeably in this report. In addition, four length-based classifications for the life stages of grayling are used: immatures are ≤ 149 mm; juveniles are 150 to 199 mm; sub-adults are 200 to 269 mm; and, adults are ≥ 270 mm FL.

Recoveries of tagged fish came from six sources:

1. test sampling by ADFG;
2. harvest sampling during scheduled ADFG creel survey programs;
3. reports by anglers directly to a creel clerk (or Game Warden or Park Ranger) but not in the angler's sampled creel;
4. random sampling in anglers' creels while test sampling;
5. voluntary reports by anglers to ADFG offices in person, by phone or mail; and,
6. through an ADFG sponsored voluntary creel survey program in the Richardson Clearwater River.

If the source of tag recoveries was not differentiated, the significance and comparison of recovery locations would be severely biased due to variable effort, gear type, and sample size (or harvest) and timing. Thus, all tag recoveries in the archived database were coded as to source of recovery. Those recoveries from sources 3 and 4 (n=66 and n=12, respectively) were combined with source 5, angler reports (n=1,059). Thus, tag recoveries are presented as coming from one of four sources; test sampling, harvest sampling, angler reports, and voluntary creel survey reports.

A total of 19,162 grayling were tagged at 13 locations during 47 events, of which 1,989 were eventually recaptured during test sampling (Appendices A2 through A48). Test sampling, including stocking of fish, occurred from 1977 through 1990 in 92 events at 15 locations, resulting in over 52,000 grayling captured (Appendices A49 through A53). Fish were collected with electrofishing boats (AC and pulsed DC), fyke traps, weir traps, seines, and hook and line. Specific study methodology and results for the majority of these events can be found in various Annual Reports of Progress and Fishery Data Series reports published by ADFG (Peckham 1978; Peckham and Ridder 1979 and 1980; Ridder 1981-1985; Holmes et al. 1986; Clark and Ridder 1987b-1990). Published dates are one year after sampling dates, i.e. specifics of Caribou Creek sampling in 1984 would be found in Ridder (1985); for results obtained in the Salcha River in 1985 refer to Holmes et al. (1986).

An enhancement program was conducted in the Delta Clearwater River from 1974 through 1978 and from 1983 through 1987. Fry were raised in ponds for three months and then transplanted into the river at river km 13. Some of these fish were held overwinter and then tagged and transplanted in June and September at lengths ranging from 170 to 230 mm FL. These age 1 fish were of two origins: 1979 and 1984 plants were from the Moose Lake stock from the Glennallen area; 1985 and 1987 plants were of Goodpaster River stock.

Harvest sampling occurred during 21 events at three locations and resulted in the examination of 3,237 grayling, including 374 tag recaptures. Sampling was conducted during creel survey studies in the Delta Clearwater River between May and September (14 events, 1977 through 1990), in the Tanana River in April

at the mouth of Shaw Creek (six events, 1981 through 1986), and in the vicinity of Big Delta (one event in 1979; Appendices A49 through A52). Specific methodology and study design can be found in Annual Reports of Progress and Fishery Data Series reports published by ADFG (Peckham 1978; Peckham and Ridder 1979 and 1980; Ridder 1981-1985; Holmes et al. 1986; Clark and Ridder 1987a; Baker 1988 and 1989; and Merritt et al. 1990). Recording of catch data was the same as above.

Angler returns (n=1,137) from 1977 through 1990 were recorded on individual forms and included tag number, tag color, date, location, length, and address if information was requested. Not all forms were completely filled out. The forms were then condensed to office files. These were eventually archived as stated earlier.

The volunteer creel survey conducted in the Richardson Clearwater River provided 356 tag recoveries. Starting in 1980, forms were distributed to summer residents on the river requesting that they record all fishing trips including number of anglers, time spent fishing, daily catch and harvest, and tag recaptures. Due to declining participation, forms were last distributed in 1983 yet some residents still either recorded the information or saved tags and/or tag numbers through 1989. Since the program may have influenced these latter reports and, if included with other angler returns, bias spatial interpretations of recapture rates, all tag recoveries from the river's residents and guests were held separate from other angler sources. These data were transcribed from office files and archived as above.

All data from these four sources (135 events in 70 ASCII files; Appendix A1) were merged into one data base file. A master tag data base file was then made by deleting all untagged fish and all recaptures of fish tagged within the same sampling (marking) event, i.e. during mark/recapture experiments or extended sampling. Recapture histories (by year and recovery locations) for each of the 47 tagging cohorts were then extracted from the data base. These recapture histories were differentiated by the four recovery sources (Appendices A2 through A48). Numbers of recaptures in each recovery location were then summed across years and presented for each tagging location in summary tables. Two summary tables are presented for each tagging location representing tag recoveries from anglers, and from test and harvest sampling combined. The latter samples were combined because of their source, known sample sizes, and constant reporting rate (100%). In all appendices and tables, recapture locations are aligned in respect to location in the Tanana River drainage, proceeding left to right from downstream to upstream.

No attempt, except that mentioned above, has been made to delete multiple recoveries of individual tags from the recapture histories. These were most numerous for fish tagged in Caribou Creek (1,775 individuals captured 2,145 times excluding marking). A lesser number of multiple captures occurred for fish tagged in the Goodpaster River (643 recoveries of 595 tags), Delta Clearwater River (711 recoveries of 676 tags), Shaw Creek (184 recoveries of 149 tags), and the Richardson Clearwater River (99 recoveries of 90 tags).

RESULTS AND DISCUSSION

Spawning Areas

Tagging of fish occurred during or immediately after spawning in the Goodpaster River, Caribou and Rapids creeks, the Volkmar River, and Ptarmigan, Buchanan, and Kiana creeks.

Goodpaster River:

Anglers recovered 6% (64) of the grayling tagged in the Goodpaster River in May (Table 3). The recoveries came from six locations, primarily the Goodpaster and Delta Clearwater rivers (42% and 41%, respectively), but other recoveries came from as far away as the Salcha River, 93 km downstream. While the primary recovery locations have similar numbers of recoveries, the absolute number of recoveries is biased by the different levels of harvest in these two systems. The average Delta Clearwater harvest is over twice that of the Goodpaster River (Table 1), so that anglers have less than half the chance of recovering a tagged grayling in the Delta Clearwater River than in the Goodpaster River.

Similarly, while recaptures in the Richardson Clearwater River accounted for only 8% of the total recoveries (11% including voluntary creel reports), the harvest is one-quarter the size of the Delta Clearwater River. The recovery rate of Goodpaster River tags in the Richardson Clearwater River, weighted by respective harvests, is thus approximately equal to the recovery rate in the Delta Clearwater River.

Complicating the simple conclusion that 58% of the Goodpaster River population in May out-migrates to other areas are possible biases resulting from: (1) differences in length compositions and locations of those fish tagged and those recaptured; and (2) the *a priori* assumption that the proportion of anglers reporting tags is the same for each fishery. Evidence of these biases are many. First, Tack (1974) sampled spawning grayling along the lower 144 km of the Goodpaster River, indicating the presence of spawners outside of the areas sampled in the 1980's. Second, Tack (1974) also found that predominantly sub-adult fish (≤ 269 mm FL) were harvested in the Goodpaster River, whereas predominantly adult grayling (≥ 270 mm FL) were harvested in the clearwater systems (Ridder 1989; Merritt et al. 1990). Lastly, Ridder (1984) found that voluntary tag return rates of anglers fishing at Shaw Creek during spring varied from 9% to 41% annually during a three year period.

Sampling by ADFG recovered 10% of the Goodpaster River fish tagged in May. The major recovery locations are similar, (with the exception of the Salcha River) to those recovery locations reported by anglers (Table 4); however, the percentages of tags recovered are not. Seventy-five percent of the recaptures came from the Goodpaster River, 18% from the Delta Clearwater River, and 6% from the Richardson Clearwater River. As with angler recaptures, comparison of recovery locations must be weighted by a common denominator. The total catch in each recovery area would be suitable provided that it be can be adjusted for size selectivity, timing, and duration of sampling projects.

Table 3. Angler-reported recaptures of grayling tagged in the Goodpaster River from 1982 through 1989. In parentheses are recaptures from the voluntary creel survey program at the Richardson Clearwater River.

Tagging		Number		Upstream → Downstream										
				Recapture Locations										
				Goodpaster			Blue	Tanana ^a	Clear	Tanana ^b				
Mo/Year	Location	Tagged	Recaptured	DCR	May	Jun-Sep	Creek	at Big D	Creek	at Shaw	Shaw	Caribou	RCR	Salcha
5/82	river km 2	115	7	4	0	2	0	1	0	0	0	---	0 (1)	0
5/85	river km 2	409	25	11	1	11	0	0	0	0	0	---	1 (1)	1
5/86	river km 2	272	15	5	0	5	0	1	1	---	0	---	2 (0)	1
5/87	river km 2	292	17	6	4	4	0	0	1	---	0	---	2 (0)	0
subtotal		1,088	64	26	5	22	0	2	2	0	0	---	5 (2)	2
8/87	river km 2-53	292	11	0	0	10	1	0	0	---	0	---	0 (0)	0
8/88	river km 2-53	1,942	64	8	4	51	0	0	0	---	0	---	0 (0)	1
8/89	river km 2-53	1,624	23	3	0	17	0	1	0	1	0	---	0 (0)	1
subtotal		3,858	98	11	4	78	1	1	0	1	0	---	0 (0)	2
Total		4,946	162	38	9	100	1	3	0	1	0	---	5 (2)	4

^a March fishery only.

^b April sample only.

Table 4. Test and harvest sample recaptures of grayling tagged in the Goodpaster River from 1982 through 1989.

				Upstream						Downstream				
Tagging		Number		Recapture Locations										
				Goodpaster			Blue	Tanana ^a	Clear	Tanana ^b		Caribou	RCR	Salcha
Mo/Year	Location	Tagged	Recaptured	DCR	May	Jun/Aug	Creek	at Big D	Creek	at Shaw	Shaw			
5/82	river km 2	115	12	1	3	7	---	---	0	0	---	1	0	0
5/85	river km 2	409	43	8	10	23	---	---	0	0	---	0	1	0
5/86	river km 2	272	25	3	5	17	---	---	---	0	---	0	0	0
5/87	river km 2	292	22	6	---	11	---	---	---	0	---	0	5	0
subtotal		1,088	102	18	18	58	---	---	0	0	---	1	6	0
8/87	river km 2-53	292	53	0	---	53	---	---	0	---	---	0	0	0
8/88	river km 2-53	1,942	225	8	---	217	---	---	0	---	---	---	---	0
8/89	river km 2-53	1,624	99	2	---	96	---	---	0	---	---	---	---	1
subtotal		3,858	377	10	---	366	---	---	0	---	---	0	0	1
Total		4,946	479	28	18	424	---	---	0	0	---	1	6	1

a March fishery only.

b April sample only.

When ADFG tag recoveries were converted to marked-to-unmarked ratios (tag recoveries divided by number examined), the magnitude of grayling migrations to the clearwater systems differs markedly from that deduced with angler tag recoveries (Figure 2). Using only the July test samples for fish ≥ 200 mm FL from 1982 through 1988 (same gear type, same proportion of stream sampled, same population structure; Appendices A38 through A41 and A49; Ridder 1985), recapture rates (recaptures divided by catch) in the Delta Clearwater were four times higher than those in the Richardson Clearwater. Differences in length compositions by season, numbers of samples, and sample timing (Tack 1974; Appendix A51) make it difficult to include Goodpaster River recoveries in this comparison.

There was one recovery in another spawning area. The fish was tagged in 1982 at 213 mm FL and recaptured 13 months later at 234 mm FL at Caribou Creek. It was classified as a juvenile during both events.

Caribou Creek:

Anglers recovered 6% (393) of the grayling tagged during the post-spawning migration from Caribou Creek (Table 5). The 11 recovery locations, the most of any tagging cohort, ranged from the Little Salcha River 69 km downstream of Shaw Creek to the Delta Clearwater River 43 km upstream. Seventy percent of the recoveries were divided almost equally between two nearby fisheries: the April fishery in the Tanana River adjacent to Shaw Creek (31%), and in the Richardson Clearwater River (39%). Recoveries in Shaw Creek accounted for 9% of the total.

Sampling by ADFG recovered 22% (1,446) of Caribou Creek tags from 10 locations, primarily at Caribou Creek (Table 6). Discounting the recoveries at Caribou Creek, the major recapture locations were similar to those reported by anglers: the Richardson Clearwater River, and the Tanana River at Shaw Creek. Unlike the angler reports however, numbers of recoveries in the Salcha River were less than those in the Delta Clearwater. The small number recovered is likely a function of differences in sampling intensity and time of sampling (Appendix A51). Prior to 1987 there was little or no sampling in the Salcha River. From 1987 on, sampling dates ranged from 23 May through 26 June while tagging effort in Caribou Creek was typically conducted between 3 and 17 June.

The two recoveries of spent adults in Gilles Creek (Ridder 1983), 61 km upstream of Caribou Creek, provides some evidence that not all adults migrate out of the Shaw Creek drainage after spawning as Tack (1980) had hypothesized. They were both initially captured two weeks previously at Caribou Creek.

Recoveries in two of the most distant fisheries, the Delta Clearwater and Salcha rivers, come from nearly all the tagging cohorts and suggest a deliberate pattern in long range movements to feeding areas. While deliberate, this pattern does vary in intensity between cohorts, i.e. greater recoveries of the 1982, 1986, and 1987 tagging cohorts.

Despite extensive sampling efforts in the Goodpaster River (Appendix A51), the few recaptures of Caribou Creek fish in the Goodpaster River are remarkable

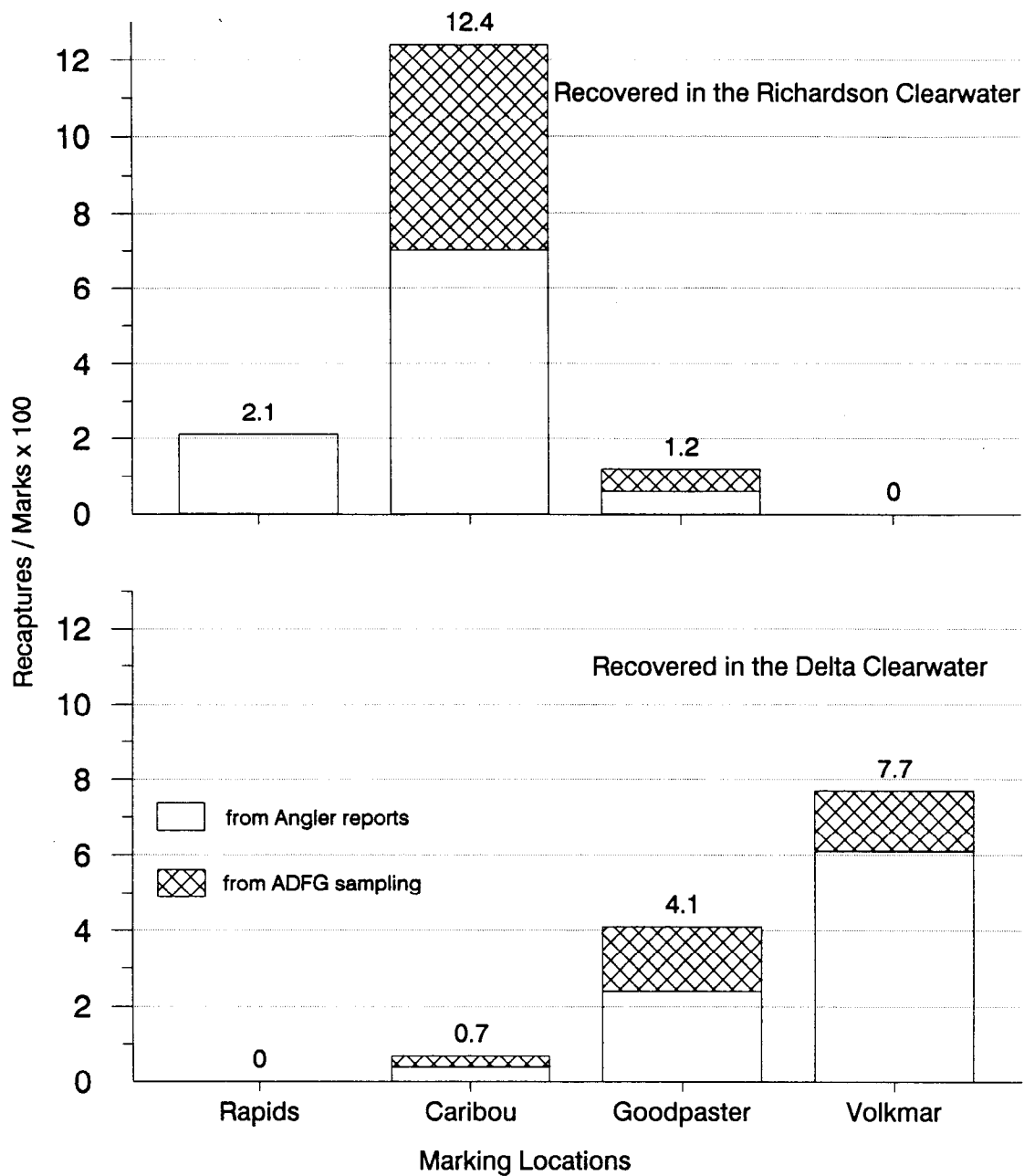


Figure 2. The recapture to mark ratio of Arctic grayling recovered in the Richardson and Delta Clearwater rivers, which were marked in the Rapids, Caribou Creek, and Goodpaster and Volkmar rivers. Data are partitioned by recovery method (angler returns and ADFG sampling). Data are summed across years (1979 through 1990).

Table 5. Angler-reported recaptures of grayling tagged in the Shaw Creek drainage from 1979 through 1988. In parentheses are recaptures from the voluntary creel survey program at the Richardson Clearwater River.

		Upstream										Downstream					
		Recapture Locations															
Tagging		Number		Tanana ^a				Tanana ^b				Little					
Mo/Year	Location	Tagged	Recaptured	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	Rapids	Gilles	RCR	5 Mile	Salcha	Salcha	Other
10/79	Shaw Creek	144	7	0	0	2	0	2	1	0	0	0	2 (3)	0	0	0	0
5/80	Shaw Creek	99	12	0	0	2	1	4	2	0	0	0	1 (6)	1	1	0	0
4/87	Shaw Creek	231	23	0	0	2	0	0	1	0	0	0	20 (5)	0	0	0	0
4/88	Shaw Creek	297	16	1	1	1	0	---	2	0	0	0	11 (4)	0	0	0	0
subtotal		771	58 (18)	1	1	7	1	6	6	0	0	0	34 (18)	1	1	0	0
5/79	Rapids Creek	22	1	0	0	0	0	1	0	0	0	0	0 (1)	0	0	0	0
5/82	Rapids Creek	11	0	0	0	0	0	0	0	0	0	0	0 (0)	0	0	0	0
5/83	Rapids Creek	108	2	0	0	0	0	1	0	0	0	0	0 (2)	0	1	0	0
subtotal		141	3 (3)	0	0	0	0	2	0	0	0	0	0 (3)	0	1	0	0
10/79	Caribou Creek	11	0	0	0	0	0	0	0	0	0	0	0 (0)	0	0	0	0
6/80	Caribou Creek	1,284	105	2	0	1	1	68	7	0	0	0	22 (104)	0	4	0	0
6/81	Caribou Creek	1,309	52	1	0	2	0	17	8	0	0	0	16 (89)	4	2	1	1 ^c
6/82	Caribou Creek	1,991	116	10	2	1	3	34	18	0	0	0	34 (87)	2	12	0	0
6/84	Caribou Creek	177	17	1	0	1	0	2	1	0	0	0	11 (2)	1	0	0	0
6/85	Caribou Creek	316	15	4	0	1	0	0	1	0	0	0	8 (2)	0	1	0	0
7/85	Caribou Creek	54	0	0	0	0	0	0	0	0	0	0	0 (2)	0	0	0	0
6/86	Caribou Creek	653	43	4	0	4	2	0	1	0	0	0	25 (13)	0	7	0	0
6/87	Caribou Creek	665	43	2	1	0	3	0	1	0	0	0	35 (4)	0	1	0	0
6/88	Caribou Creek	44	2	0	0	0	0	0	0	0	0	0	2 (2)	0	0	0	0
subtotal		6,504	393	24	3	10	9	121	37	0	0	0	153 (305)	7	27	1	1
Total		7,416	454	25	4	17	10	129	43	0	0	0	187 (326)	8	29	1	1

^a March fishery only. ^b April fishery only. ^c Buchanan Creek.

Table 6. Test and harvest sample recaptures of grayling tagged in the Shaw Creek drainage from 1979 through 1988.

		Upstream											Downstream					
		Recapture Locations																
Tagging	Tagging	Number		Tanana ^a				Tanana ^b				5				Little		
Mo/Year	Location	Tagged	Recaptured	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	Rapids	Gilles	RCR	Mile	Salcha	Salcha	Other	
10/79	Shaw Creek	144	14	1	0	---	0	3	0	7	0	0	3	0	0	---	---	
5/80	Shaw Creek	99	27	1	0	---	0	4	0	17	0	1	4	0	0	---	---	
4/87	Shaw Creek	231	55	2	1	---	---	9	---	4	---	---	38	---	1	---	---	
4/88	Shaw Creek	297	12	0	0	---	---	---	---	0	---	---	12	---	0	---	---	
subtotal		771	108	4	1		0	16	0	28	0	1	57	0	1			
5/79	Rapids Creek	22	1	0	0	---	0	0	1	0	0	0	0	0	0	---	---	
5/82	Rapids Creek	11	1	0	0	---	0	0	0	0	1	0	0	0	0	---	---	
5/83	Rapids Creek	108	4	0	0	---	0	4	0	0	0	0	0	0	0	---	---	
subtotal		141	6	0	0		0	4	1	0	1	0	0	0	0			
10/79	Caribou Creek	11	4	0	1	---	0	1	0	2	0	0	0	0	0	---	---	
6/80	Caribou Creek	1,284	366	1	0	---	4	65	1	206	0	1	88	1	0	---	---	
6/81	Caribou Creek	1,309	466	1	0	---	2	47	---	364	0	0	53	---	0	---	---	
6/82	Caribou Creek	1,991	355	5	1	---	5	51	---	210	0	1	82	---	0	---	---	
6/84	Caribou Creek	177	48	0	0	---	0	8	---	10	---	---	30	---	0	---	---	
6/85	Caribou Creek	316	54	1	0	---	---	8	---	25	---	---	20	---	0	---	---	
7/85	Caribou Creek	54	6	0	0	---	---	0	---	6	---	---	0	---	0	---	---	
6/86	Caribou Creek	653	80	3	1	---	---	15	---	30	---	---	31	---	0	---	---	
6/87	Caribou Creek	665	61	5	0	---	---	7	---	5	---	---	43	---	1	---	---	
6/88	Caribou Creek	44	6	0	0	---	---	---	---	---	---	---	4	---	2	---	---	
subtotal		6,504	1,446	16	3	---	11	201	1	858	0	2	351	1	3	---	---	
Totals		7,416	1,561	19	4	---	11	222	1	886	1	3	408	1	4	---	---	

^a March fishery only.

^b April fishery only.

for two reasons: selection of feeding areas and homing to spawning areas. The lower Goodpaster River is considered to be of low productivity (Van Wyhe 1964) and experiences high water temperatures, while the Delta Clearwater River, 11 km further upstream, with 13 times the number of recaptures, has a high productivity and cool temperatures (Pearse 1974). Of the five recoveries in the Goodpaster River, none were recovered during the time of spawning.

Some interesting questions arise with these Goodpaster River recoveries when time of tagging, time of recovery, and maturity at tagging and recovery are considered. These questions are germane to the other tagging cohorts as well. All fish were recaptured late in the season, between 2 August and 11 September (Appendices A21, A24, A28, and A29), and three of the five recaptures were mature adults when tagged. Two of these adults were tagged in the same year. What are fish that were tagged in other streams in the spring or summer doing in the Goodpaster River in early and late fall?

Rapids Creek:

Anglers and ADFG recaptured 2% (3) and 4% (6), respectively, of grayling tagged in Rapids Creek. All but one recovery came from either the Shaw Creek drainage or near the mouth of Shaw Creek at the Tanana River (Tables 5 and 6; Appendices A35-A37). The lone "outside" recovery was from the Salcha River. The voluntary creel survey program recovered another 2% (3) in the Richardson Clearwater River. It is noteworthy that despite extensive sampling, no recoveries were made in Caribou Creek, the only other known spawning location in the Shaw Creek drainage.

Recovery rates of Rapids Creek fish are much below those of Caribou Creek fish even with similar numbers in the tagging cohorts. One hypothesis is that the proportion of fish out-migrating Rapids Creek to other systems is lower than for Caribou Creek. The proportion of fish migrating from spawning areas in Shaw Creek, as well as other drainages, to different streams may then be related to location in the drainage. Rapids Creek and Caribou Creek are located 46 km and 10 km above the mouth of Shaw Creek, respectively.

Volkmar River:

Anglers and ADFG recovered 9% (14) and 3% (4), respectively, of grayling tagged in the Volkmar River in May (Tables 7 and 8; Appendices A45 - A47). Besides the Volkmar River, recoveries came from just two other locations: 83% from the Delta Clearwater and 6% from Clearwater Lake outlet. No recaptures came from spawning streams other than the Volkmar River. While these recovery data resulted from numerically small releases of tagged fish, similar releases in other streams have produced recoveries in a greater number of locations. The absence of any significant fisheries and no test sampling upstream of the Volkmar River may have biased other recoveries.

Other systems:

Three other potential spawning streams, Ptarmigan, Buchanan, and Kiana creeks, were surveyed and sampled in 1983 (Appendix A53). Less than 30 fish, predominantly sub-adults, were tagged in each. No recoveries were made. Of

Table 7. Angler-reported recaptures of grayling tagged in Clear Creek, Richardson Clearwater River, and the Volkmar River from 1979 through 1988. In parentheses are recaptures from the voluntary creel survey program at the Richardson Clearwater River.

Tagging		Number		Upstream → Downstream										
				Recapture Locations										
				Clearwater		Tanana ^a		Tanana ^b						
Mo/Year	Location	Tagged	Recaptured	other	Lake	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	RCR	Salcha
9/79	Clear Creek	67 ^c	0	0	0	0	0	0	0	0	0	0	0	0
7/82	Clear Creek	62	8	1 ^d	1	1	0	0	0	4	1	0	0	0
8/84	Clear Creek	58	9 (1)	0	0	0	0	0	1	2	1	0	0 (1)	0
Total		187	17 (1)	1	1	1	0	0	1	6	2	0	0 (1)	0
6/80	RCR	33	4 (3)	0	0	0	0	0	1	1	0	0	2 (3)	0
7/88	RCR	749	52 (24)	0	0	1	0	1	0	---	0	0	50 (24)	0
Total		782	56 (27)	0	0	1	0	1	1	1	0	0	52 (27)	0
5/80	Volkmar River	113	12	0	1	11	0	0	0	0	0	0	0	0
5/81	Volkmar River	50	2	0	0	2	0	0	0	0	0	0	0	0
9/81	Volkmar River	149	7	2 ^e	0	5	0	0	0	0	0	0	0	0
Total		312	21	2	1	18	0	0	0	0	0	0	0	0

a March fishery only.

b April fishery only.

c These were fish stocked in the creek's headwaters.

d Blue Creek.

e Both from Volkmar River.

Table 8. Test and harvest sample recaptures of grayling tagged in Clear Creek, Richardson Clearwater River, and the Volkmar River from 1979 through 1988.

		<div>Upstream Downstream</div>												
		Recapture Locations												
Tagging		Number		Clearwater			Tanana ^a		Tanana ^b					
Mo/Year	Location	Tagged	Recaptured	other	Lake	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	RCR	Salcha
9/79	Clear Creek	67 ^c	1	---	---	0	0	---	1	0	---	0	0	0
7/82	Clear Creek	62	7	---	---	0	1	---	2	1	---	3	0	0
8/84	Clear Creek	58	9	---	---	0	1	---	3	3	---	2	0	0
Total		187	17	---	---	0	2 ^d	---	6	4	---	5	0	0
6/80	RCR	33	15	---	---	0	0	---	0	2	---	5	8	0
7/88	RCR	749	0	---	---	0	0	---	---	---	---	---	---	0
Total		782	15	---	---	0	0	---	0	2	---	5	8	0
5/80	Volkmar River	113	2	0	---	2	0	---	0	0	---	0	0	0
5/81	Volkmar River	50	2	2 ^e	---	0	0	---	0	0	---	0	0	0
9/81	Volkmar River	149	3	0	---	3	0	---	0	0	---	0	0	0
Total		312	7	2	---	5	0	---	0	0	---	0	0	0

^a March fishery only.

^b April fishery only.

^c These were fish stocked in the creek's headwaters.

^d One recapture (1982 tag) during May sampling and the other during August sampling.

^e Volkmar River

the three streams, the bog and spring fed Kiana Creek appeared the most likely to be a spawning area (Ridder 1983).

Feeding Areas

Tagging of fish occurred in the Delta and Richardson Clearwater rivers, Clear Creek, the Goodpaster and Volkmar rivers, and Caribou and Shaw creeks.

Delta Clearwater River:

Most of both the wild and stocked grayling marked in the Delta Clearwater River were recovered within the same river (Appendices A2 through A15). These recaptures (373) accounted for 88% of all angler returns (Table 9). Due to limitations in recovery locations, ADFG sampling recovered 95% (271) of all recaptures in the Delta Clearwater River (Table 10). Clearwater Lake Outlet, located less than 1.6 km below the river and fed by the same aquifer as the river, accounted for 8% (35) of angler returns (no test sampling occurred there).

These recapture rates indicate a high degree of homing to the Delta Clearwater River. The recovered proportion can be increased to 99% for the angler recoveries by including Clearwater Lake Outlet in the system (as did Roguski and Schallock 1967), and by considering the time and location of the "outside" recaptures. All but six of these recaptures (n=18) were recovered either during early April in the Tanana River, mid-May in the Volkmar River, early June in Shaw Creek, or late August in the Goodpaster River and Shaw Creek. Since Delta Clearwater River fish are known to overwinter in the Tanana River (Tack 1980), spawn in the Volkmar River and Shaw Creek drainages (Ridder 1982), and out-migrate from the Delta Clearwater River beginning as early as August (Reed 1964; Pearse 1974) the majority of these "outside" recaptures cannot be considered strays or fish unfaithful to a feeding area. The remaining "outside" recaptures, 1.4% of all angler recoveries, were fish caught in mid-summer in the Salcha, Richardson Clearwater, and Goodpaster rivers and in Clear Creek. Five of these recoveries were made one or more years after tagging.

The incidence of straying is further reduced if not all fish immigrating in April and May remain for summer feeding. Twelve percent of the recoveries anglers made in the same year as tagging occurred outside the river (29 of 231 recaptures; Appendices A2 through A15). All but three of these recaptures were from Clearwater Lake Outlet. The remaining recoveries, 2% of the total, were fish from Shaw Creek in late August, from Dry Creek in mid-June, and from the Richardson Clearwater River in mid-July. All were juveniles ranging in length from 200 to 226 mm FL.

A similar look at the recoveries from ADFG sampling support the hypothesis that approximately 1% or less of all fish tagged in the Delta Clearwater River during spring immigration either do not ascend the river or stray from the river/lake system in future years. Of all fish recovered outside the Delta Clearwater River and lake system (n=14), all but one could be considered migrating to and/or from spawning and overwintering areas. The recoveries in the April fishery at the mouth of Shaw Creek and the post-spawning run out of

Table 9. Angler-reported recaptures of grayling tagged in the Delta Clearwater River from 1977 through 1988.

Tagging		Number		Upstream						Downstream				
				Recapture Locations										
				Clearwater			Tanana ^a			Tanana ^b				
Mo/Year	Location	Tagged	Recaptured	other	Lake	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	RCR	Salcha
4/77	river km 1.6	583	63	2 ^c	10	48	0	2	0	0	1	0	0	0
4/78	river km 1.6	878	147	0	14	125	1	4	0	0	1	0	2	0
4/79	river km 1.6	139	23	0	1	20	0	0	0	0	0	0	0	2
4/80	river km 1.6	60	5	0	1	4	0	0	0	0	0	0	0	0
4/81	river km 1.6	68	11	0	1	10	0	0	0	0	0	0	0	0
4/82	river km 1.6	28	3	0	0	3	0	0	0	0	0	0	0	0
5/88	river km 1.6	548	73	0	3	69	0	1	0	0	0	0	0	0
7/88	river km 22-27	28	3	0	0	3	0	0	0	0	0	0	0	0
Subtotal		2,332	328	2	30	282	1	7	0	0	2	0	2	2
9/79	stocked at 13 km	651	25	0	1	24	0	0	0	0	0	0	0	0
6/84	stocked at 13 km	1,039	26	0	3	23	0	0	0	0	0	0	0	0
9/84	stocked at 13 km	125	4	0	0	4	0	0	0	0	0	0	0	0
6/85	stocked at 13 km	553	10	0	1	7	1	0	1	0	0	0	0	0
9/85	stocked at 13 km	647	28	0	0	28	0	0	0	0	0	0	0	0
10/87	stocked at 13 km	90	5	0	0	5	0	0	0	0	0	0	0	0
Subtotal		3,105	98	0	5	91	1	0	1	0	0	0	0	0
Total		5,437	426	2	35	373	2	7	1	0	2	0	2	2

^a March fishery only.

^b April fishery only.

^c Volkmar River, Dry Creek

Table 10. Test and harvest sample recaptures of grayling tagged in the Delta Clearwater River from 1977 through 1988.

		Upstream → Downstream												
		Recapture Locations												
Mo/Year	Tagging Location	Number		Clearwater			Tanana ^a		Tanana ^b					
		Tagged	Recaptured	other	Lake	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	RCR	Salcha
4/77	river km 1.6	583	44	---	---	44	0	---	0	0	0	0	0	0
4/78	river km 1.6	878	50	---	---	46	0	---	0	1	0	3	0	0
4/79	river km 1.6	139	10	---	---	9	0	---	0	1	0	0	0	0
4/80	river km 1.6	60	4	---	---	4	0	---	0	0	0	0	0	0
4/81	river km 1.6	68	2	---	---	1	0	---	0	0	0	1	0	0
4/82	river km 1.6	28	0	---	---	0	0	---	0	0	0	0	0	0
5/88	river km 1.6	548	77	---	---	71	6	---	---	---	---	0	0	0
7/88	river km 22-27	28	5	---	---	4	1	---	---	---	---	---	---	0
Subtotal		2,332	192	---	---	179	7	---	0	2	0	4	0	0
7/79	stocked at 13 km	651	23	---	---	22	0	---	0	0	0	0	1	0
6/84	stocked at 13 km	1,039	7	---	---	7	0	---	0	0	0	0	0	0
9/84	stocked at 13 km	125	4	---	---	4	0	---	0	0	0	0	0	0
6/85	stocked at 13 km	553	15	---	---	15	0	---	0	0	0	0	0	0
9/85	stocked at 13 km	647	31	---	---	31	0	---	0	0	0	0	0	0
10/87	stocked at 13 km	90	13	---	---	13	0	---	0	0	0	0	0	0
Subtotal		3,105	93	---	---	92	0	---	0	0	0	0	1	0
Total		5,437	285	---	---	271	7	---	0	2	0	4	1	0

^a March fishery only.

^b April fishery only.

Caribou Creek obviously came during the spawning migrations. Less obvious were the Goodpaster River recoveries (n=7), which can be considered early out-migrants to overwintering areas based on time at tagging and recapture (Appendices A8 and A9). All were recaptured between 8 and 18 August. Five of these were recaptured in the same year as tagging.

Richardson Clearwater River:

The predominant recapture location for grayling tagged in the Richardson Clearwater River was the Richardson Clearwater River (Appendices A16 and A17). The river accounted for 93% (79) of all angler returns (Table 7) and 53% (8) of all recaptures from test sampling (Table 8).

As in the Delta Clearwater River, these percentages and thus the hypothesis for homing to feeding areas increases dramatically when timing and locations of the "outside" recaptures are considered. The majority of these came from either the Tanana River in April or from Caribou Creek in early June. Deleting these recoveries increases the angler return in the Richardson Clearwater River to 96% and the test returns to 100%. However, these percentages are based on a small number of recoveries.

Clear Creek:

Unlike the larger spring-fed systems, recoveries of grayling tagged in Clear Creek were more apt to come from other locations (Tables 7 and 8; Appendices A19 and A20). Anglers and ADFG recovered only 6% and 35%, respectively, of the tagged fish released in Clear Creek. Adjusting the recaptures for timing and location (deleting those spring recoveries from the Tanana River and spawning streams), increases the recaptures in the creek to 11% of angler returns and 86% of test sample recaptures. The light fishing pressure expended in Clear Creek most likely affected the angler return percentage. Yet, considering the variable presence and low numbers of grayling in the creek (Ridder 1983, 1985), the small size, and angler recoveries in four other spring systems, the tendency to home to small spring-fed feeding areas may not be as strong as that found in the larger spring-fed systems.

Goodpaster River:

Despite the short time at large, anglers and ADFG, during August, recovered 2% (78) and 9% (366) of the grayling tagged since 1987 in the Goodpaster River (Tables 3 and 4; Appendices A42-A44). The majority of recoveries came from the Goodpaster River, accounting for 83% of angler returns and 97% of ADFG returns. The other recovery locations, predominantly the Delta Clearwater River (anglers = 11%; ADFG = 3%), extend along the same reach of the Tanana River as the May tagging cohorts; extending from the Delta Clearwater River to the Salcha River, although the percentages of recoveries in each are much lower. The one exception is that no recoveries came from the Richardson Clearwater River. The cessation of ADFG sampling effort after 1988 may be partially responsible.

While recovery rates of the August cohorts in other systems is less than the May cohorts, the short time at large for the majority of the tagged fish

prevents any definitive qualification of this result. The recaptures do partly support Reed's (1961) findings that recaptures of fish tagged in the Goodpaster River usually occur in the Delta Clearwater River two to three years after tagging and occur at ages of 5 and older. The predominant age and mean size of the 1988 tagging cohort was age 5 and 254 mm FL, respectively; the 1989 cohort was age 2 and 230 mm FL (Clark and Ridder 1990). For recoveries in the Delta Clearwater River, mean size at tagging was 262 mm FL for the 1988 cohort and 313 mm FL for the 1989 cohort, both readily representing age 5 or older fish. However, Reed's findings fail to explain the lack of recoveries in the Delta Clearwater River of the 1987 cohort, which were predominantly age 4 fish (Clark and Ridder 1990).

The timing and relatively large number of tag recoveries from the Delta Clearwater River suggest migrations of a significant magnitude. Of the 21 fish recovered in the Delta Clearwater River, 15 were specific to two months during the summer. All except one of the recoveries were recaptured in June and July the year after tagging. Similar to the August recaptures of Delta Clearwater tags in the Goodpaster River, these recaptures may actually be fish that had already spent most of the summer in the Delta Clearwater River, out-migrated early, and came to the Goodpaster for overwintering at time of tagging. Continued sampling and tagging in both rivers in conjunction with analysis of recoveries in relation to the time, length, and age at tagging and recovery will clarify this migration pattern. Estimates of abundance performed in August and the consequential estimates of dynamic rates of Goodpaster River fish may have to be refined to account for these movements.

Volkmar River:

Anglers and ADFG recovered 5% (7) and 2% (3), respectively, of grayling tagged in September in the Volkmar River (Tables 7 and 8; Appendix A47). While the overall recapture rate and locations were similar to the May tagging cohorts, the timing of the recoveries made in the Delta Clearwater River (the only "outside" destination for the cohorts) were not similar. Twenty-five percent of the recoveries of the September cohort came within the first year of tagging compared to 64% of the May cohorts (Appendices A45 and A46). These results conform to Reed's (1961) finding that older fish are more apt to migrate to another stream. The September cohorts were predominantly sub-adult fish ≤ 269 mm (60%) while the May cohorts were predominantly adults (62%; Appendix A50, page 2). Seventy-five percent of September cohort recoveries were sub-adults when tagged, while 71% of the May cohort recoveries were adults when tagged.

Caribou Creek:

Numbers of fish tagged in Caribou Creek were small, predominantly sub-adult fish (Appendix A50), and not all were tagged during the summer months. The October cohort is included under the assumption that they were summer residents of Caribou Creek. It is unlikely that grayling would ascend a creek in early October that ultimately freezes solid in the winter. These fish were caught in a downstream weir, presumably on their outmigration to an overwintering area.

Anglers reported no recoveries of the grayling tagged in October and July in Caribou Creek although the volunteer creel survey program in the Richardson Clearwater River did report two recoveries of the October cohort (Table 5; Appendices A21 and A27). ADFG sampling recovered 15% of this cohort, with all but one coming from either Caribou Creek or the mouth of Shaw Creek (Table 6). The other recovery was tagged as a juvenile (211 mm) in October 1979 and recaptured six years later as an adult male (275 mm) while spawning in the Goodpaster River.

Shaw Creek:

Although two cohorts were tagged in May and October, they are considered here as representing a summer feeding population. Seventy percent of the May cohort were sub-adult fish as opposed to 30% sub-adults found in the post-spawning run out of Caribou Creek (Appendix A50). They were also tagged well after the upstream migration of adults (Ridder 1981, 1982). The assumption is easily applied to the October cohort which was also comprised of 70% sub-adults.

Eighty-four percent of angler recoveries of both cohorts came from outside the Shaw Creek drainage, principally in the April fishery in the Tanana River (Table 5; Appendices A31 and A32). Discounting these as coming from an overwintering area, the remaining recoveries were still three times more likely to be made in feeding areas other than Shaw Creek.

Time of tagging appeared to influence recoveries of these sub-adults and possibly invalidate the above assumption. Angler recaptures of the May cohort were twice as great and from more diverse locations than those of the October cohort.

Test sampling recovered 17% of the cohorts, with over half of these coming from the Caribou Creek (Table 6). As with anglers, recoveries of the May cohort were twice as numerous as the October cohort. Locations of recoveries were also similar.

Overwintering Areas

Grayling were tagged at two overwintering areas in the Tanana River. One area was at the confluence of Shaw Creek with the Tanana River and the other area was the Tanana River near the town of Big Delta (Figure 1).

Tanana River at Shaw Creek:

Test sampling and tagging of fish at the mouth of Shaw Creek was initiated to continue the recovery of Caribou Creek tags that had been recovered by the fishery prior to 1987 (Appendix A50). Prior to 1987, tag recoveries during the fishery were being used in a Jolly-Seber model of abundance estimation (Clark and Ridder 1987b). It was assumed this pre-spawning congregation of adults represented a spawning stock from the Shaw Creek drainage. The subsequent recovery locations of the two cohorts were the same as for Caribou Creek tags, predominantly the Richardson Clearwater River and as distant as the Delta Clearwater and Salcha rivers (Tables 11 and 12; Appendices A33 and

Table 11. Angler-reported recaptures of grayling tagged in the Tanana River from 1979 through 1988. In parentheses are recaptures from the voluntary creel survey program at the Richardson Clearwater River.

				Upstream										Downstream			
				Recapture Locations													
Tagging		Number		Tanana ^a				Tanana ^b				5				Little	
Mo/Year	Location	Tagged	Recaptured	DCR	GPR	at Big D	Clear	at Shaw	Shaw	Caribou	Rapids	Gilles	RCR	Mile	Salcha	Salcha	Other
4/87	Shaw Creek	231	23	0	0	2	0	0	1	---	---	---	20 (5)	0	0	0	0
4/88	Shaw Creek	297	16	1	1	1	0	---	2	---	---	---	11 (4)	0	0	0	0
Total		528	39 (18)	1	1	3	0	0	3	---	---	---	31 (9)	0	0	0	0
4/80	Big Delta	8	1	0	0	1	0	0	0	---	---	---	0	0	0	0	0

a March fishery only.

b April sample only.

Table 12. Test and harvest sample recaptures of grayling tagged in the Tanana River from 1979 through 1988.

		Upstream →												Downstream			
		Recapture Locations															
Tagging Mo/Year	Tagging Location	Number		DCR	GPR	Tanana ^a	Tanana ^b						5		Little		Other
		Tagged	Recaptured			at Big D	Clear	at Shaw	Shaw	Caribou	Rapids	Gilles	RCR	Mile	Salcha	Salcha	
4/87	Shaw Creek	231	55	2	1	---	---	9	---	4	---	---	38	---	1	---	0
4/88	Shaw Creek	297	12	0	0	---	---	---	---	0	---	---	12	---	0	---	0
Total		528	67	2	1		0	9	0	4	0	0	50	0	1	---	0
4/80	Big Delta	8	0	0	0	---	0	0	0	0	0	0	0	0	0	---	0

^a March fishery only.

^b April sample only.

A34). However, two recoveries from a single cohort provide evidence contrary to the assumption of a single stock of fish. The fish recovered from the Goodpaster River, a 297 mm FL ripe male, was recovered at the spawning grounds on 12 May. The fish recovered from the Salcha River, a 367 mm FL female, was recovered at river kilometer 12 on 9 June. The Salcha fish could have spawned in Caribou Creek or some other location in Shaw Creek since the post spawning migration out of Caribou historically commences in the first week of June (Ridder 1985; Holmes, et al. 1986; Clark and Ridder 1987b). The fish also could have spawned in the Salcha River. These two recoveries, in addition to those recoveries in the Tanana River of other cohorts, leads to a hypothesis that overwintering areas provide for a mixing of populations that subsequently exhibit the distinct migration patterns seen here.

Tanana River at Big Delta:

One recovery was reported by an angler of the eight grayling tagged in the 8 km reach below Big Delta (Appendix A48). It was caught one year after tagging off the mouth of Shaw Creek.

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LITERATURE CITED

- Baker, T. T. 1988. Creel censuses in Interior Alaska in 1987. Alaska Department of Fish and Game Fishery Data Series No. 64, Juneau, Alaska. 138pp.
- _____. 1989. Creel censuses in Interior Alaska in 1987. Alaska Department of Fish and Game Fishery Data Series No. 95, Juneau, Alaska. 138pp.
- Clark, R. A., and W. P. Ridder. 1987a. Tanana drainage creel census and harvest surveys, 1986. Alaska Department of Fish and Game, Fishery Data Series No. 12. 91 pp.
- _____. 1987b. Abundance and length composition of selected grayling stocks in the Tanana drainage during 1986. Alaska Department of Fish and Game, Fishery Data Series No. 26, Juneau, Alaska. 55 pp.

LITERATURE CITED (Continued)

- _____. 1988. Stock assessment of Arctic grayling in the Tanana River drainage. Alaska Department of Fish and Game, Fishery Data Series No. 54, Juneau, Alaska. 79 pp.
- _____. 1990. Stock assessment of Arctic grayling in the Salcha, Chatanika, and Goodpaster rivers. Alaska Department of Fish and Game, Fishery Data Series No. 90-7, Anchorage, Alaska. 84 pp.
- Holmes, R. A., W. P. Ridder, and R. A. Clark. 1986. Distribution, abundance, and natural history of the Arctic grayling in the Tanana River drainage. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986. Project F-10-1, 27(G-8-I). 68 pp.
- Merritt, M. F., A. E. Bingham, and N. Morton. 1990. Creel surveys conducted in Interior Alaska during 1989. Alaska Department of Fish and Game Fishery Data Series No. 90-54, Juneau, Alaska. 138pp.
- Mills, M. J. 1979. Alaska statewide sport fish harvest studies (1977). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (SW-I-A). 122 pp.
- _____. 1980. Alaska statewide sport fish harvest studies (1978). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-I-A). 65 pp.
- _____. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A). 77 pp.
- _____. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A). 107 pp.
- _____. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23(SW-I-A). 115 pp.
- _____. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24(SW-I-A). 118 pp.
- _____. 1984. Alaska statewide sport fisheries harvest report 1983). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984. Project F-9-16, 25(SW-I-A). 118 pp.

LITERATURE CITED (Continued)

- _____. 1985. Alaska statewide sport fisheries harvest report (1984). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1984-1985. Project F-9-17, 26(SW-I-A). 137 pp.
- _____. 1986. Alaska statewide sport fisheries harvest report (1985). Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986. Project F-10-1, 27(RT-2). 137 pp.
- _____. 1987. Alaska statewide sport fisheries harvest report (1986). Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau, Alaska. 140 pp.
- _____. 1988. Alaska statewide sport fisheries harvest report (1987). Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau, Alaska. 142 pp.
- _____. 1989. Alaska statewide sport fisheries harvest report (1988). Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau, Alaska. 142 pp.
- _____. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game. Fishery Data Series No. 90-44, Anchorage, Alaska. 152 pp.
- Nagata, T. 1963. Investigations of the Tanana River grayling fisheries: migration study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1962-1963, Project F-5-R-4, 4(14-B): 483-505.
- Pearse, G. A. 1974. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1973-1974, Project F-9-6, 15(G-III-G): 49pp.
- Peckham, R. D. 1978. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1977-1978, Project F-9-10, 19(G-III-G): 22-45.
- Peckham, R. D. and W. P. Ridder. 1979. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1978-1979, Project F-9-11, 20(G-III-G): 25-64.
- _____. 1980. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1979-1980, Project F-9-11, 21(G-III-G): 1-93.

LITERATURE CITED (Continued)

- Reed, R. J. 1961. Investigations of the Tanana River grayling fisheries: migration study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1960-1961, Project F-5-R-2, 2(3-B): 195-214.
- _____. 1964. Life history and migration patterns of Arctic grayling, Thymallus arcticus, (Pallas), in the Tanana River Drainage of Alaska. Alaska Department of Fish and Game. Research Report No. 2. 30p.
- Ridder, W. P. 1981. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1980-1981, Project F-9-13, 22(G-III): 1-58.
- _____. 1982. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1982-1983, Project F-9-14, 23(G-III): 1-61.
- _____. 1983. A study of a typical spring-fed stream of interior Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1982-1983, Project F-9-15, 24(G-III): 1-54.
- _____. 1984. Life history and population dynamics of exploited grayling stocks - Delta and Richardson Clearwater Rivers. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1983-1984. Project F-9-16, 25(G-III-G): 1-49.
- _____. 1985. Life history and population dynamics of exploited grayling stocks - Delta and Richardson Clearwater Rivers. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1984-1985. Project F-9-17, 26(G-III-G): 1-58.
- _____. 1989. Age, length, sex, and abundance of Arctic grayling in the Richardson Clearwater River and Shaw Creek, 1988. Alaska Department of Fish and Game. Fishery Data Series No.120. Anchorage, Alaska. 35 pp.
- Roguski, E. A. and E. W. Schallock. 1967. Investigations of the Tanana River and Tangle Lakes grayling fisheries: migratory and population study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1966-1967, Project F-5-R-8, 8(16-B): 247-255.
- Tack, S. L. 1974. Distribution, abundance, and natural history of the Arctic grayling in the Tanana River drainage. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1973-1974. Project F-9-6, 15(R-I). 52 pp.

LITERATURE CITED (Continued)

- _____. 1980. Distribution, abundance, and natural history of the Arctic grayling in the Tanana River drainage. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1971-1980. Project F-9-12, 21(R-I). 32 pp.
- Van Wyhe, G. 1964. Investigations of the Tanana River grayling fisheries: migration study. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Job Completion Report, 1963. Project F-5-R-5, 5(14-B). 16 pp.
- Warner, G. 1957. Movements and migrations of grayling in Interior Alaska. U.S. Fish and Wildlife Service, Federal Aid in Fish Restoration, Quarterly Progress Report. Project F-1-R-6, Work Plan C, Job No. 3, 6(4). 5 pp.
- _____. 1958. Movements and migrations of grayling in Interior Alaska. U.S. Fish and Wildlife Service, Federal Aid in Fish Restoration, Quarterly Progress Report. Project F-1-R-7, Work Plan C, Job No. 3, 7(3). 15 pp.
- _____. 1959. Tagging and migration of grayling in Interior Alaska. U.S. Fish and Wildlife Service, Federal Aid in Fish Restoration, Quarterly Progress Report. Project F-1-R-8, Work Plan C, Job No. 3, 8(2). 10 pp.

APPENDIX A

Appendix A1. File listings for angler-reported tag returns, test and harvest sampling, and stocking of grayling in waters of the middle Tanana River drainage, 1977 through 1990.

Location	Year	File Content	File Name
All	1977	Angler Tag Reports	in DANGTAGS.dta
"	1978	"	"
"	1979	"	"
"	1980	"	"
"	1981	"	"
"	1982	"	"
"	1983	"	"
"	1984	"	"
"	1985	"	"
"	1986	"	"
"	1987	"	"
"	1988	"	"
"	1989	"	"
"	1990	"	"
Delta Clearwater	1977	April Test ^a	U006ALC8.dta
"	1978	"a	U006ALD8.dta
"	1979	"a	U006ALE8.dta
"	1980	"a	U006ALA0.dta
"	1981	"a	"
"	1982	"a	"
"	1984-1985	"a	in DEL-TAG.dta
"	1986	"	U0006ABA.dta
"	1987	"	U006ABA7.dta
"	1988	"	U006ALA8.dta
"	1988	Test/May	U006ALB8.dta
"	1978	Test/July	U0060LB0.dta
"	1979	"	"
"	1980	"	"
"	1981	"	"
"	1982	"	"
"	1983	"	"
"	1984	"	"
"	1985	"	"
"	1986	"	U00060BA.dta
"	1987	"	U0060BB7.dta
"	1988	Test/Jul/Aug	U0060LD8.dta
"	1977	Harvest Sample	U006ALA0.dta
"	1978	"	U0060LB8.dta
"	1979	"	U0060LC8.dta
"	1980	"	U0060LC0.dta
"	1981	"	"
"	1982	"	"

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Location	Year	File Content	File Name
Delta Clearwater	1983	Harvest Sample	U0060LC0.dta
"	1984	"	"
"	1985	"	"
"	1986	"	U00060BA.dta
"	1987	"	U0060BA7.dta
"	1988	"	U0060LE8.dta
"	1989	"	U0060LA9.dta
"	1990	"	U0060LD0.dta
"	1979-1985	Stocking	ENH-TAGS.dta
"	1987	"	"
Richardson Clearwater	1980	Test/June	U0070LA8.dta
"	1980	Test/July	U0070LB8.dta
"	1981	"	"
"	1982	"	U0070LD8.dta
"	1983	"	"
"	1984	"	U0070LB8.dta
"	1985	"	U0070LA0.dta
"	1986	"	U0007ABA.dta
"	1986	"	U0007BBA.dta
"	1986	"	U0007CBA.dta
"	1987	"	U0070LA7.dta
"	1988	"	U0070LC8.dta
"	1980-1989	Voluntary Creel Census	DANGTAGS.dta
Goodpaster	1982, 1985	Test/May	U0080LA8.dta
"	1986	"	U00080BA.dta
"	1987	"	U0080LA7.dta
"	1985	Test/June ^a	in DEL-TAG.dta
"	1985	Test/August ^a	"
"	1986	"	U0008FBA.dta
"	1986	"	U0008CBA.dta
"	1987	"	U008CBA7.dta
"	1987	"	U008FBA7.dta
"	1988	"	U0080LB8.dta
"	1989	"	U0080LA9.dta
"	1989	"	U0080LB9.dta
"	1990	"	U0080LA0.dta
"	1990	"	U0080LB0.dta
Caribou	1979	Test/Sept	CARAWL79.dta
"	1980	Test/June	U4810LA0.dta
"	1981	"	CARIBOU.dta
"	1982	"	"
"	1983	"	"
"	1984	"	U4810LA9.dta

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Location	Year	File Content	File Name
Caribou	1985	Test/June	CARIBOU.dta
"	1985	Test/July	U4810LB0.dta
"	1986	Test/June	U4810LA6.dta
"	1987	"	U4810LA7.dta
"	1988	"	U4810LA8.dta
Shaw	1979-1980	Test/May/Sept ^a	U0160LA0.dta
Shaw Mouth	1981	Harvest Sample	U0160LA9.dta
"	1982	"	U275PLA9.dta
"	1983	"	U275PLB9.dta
"	1984	"	U275PLC9.dta
"	1985	"	U275PLD9.dta
"	1986	"	U00160BA.dta
"	1987	Test/April	U0160BA7.dta
"	1988	"	U275PLA8.dta
Rapids	1979-1983	Test/May	U4720LA9.dta
Gilles	1982	Test/June	GILAWL.dta
Volkmar	1980-1981	Test/All	U2910LA8.dta
Clear	79-84	Test	U4740LA8.dta
"	1985	"	U4740LA0.dta
"	1979	Stocking	CLEARENH.dta
Tanana	1979	Harvest Sample	U275JLA0.dta
"	1980	Test	in U006ALA0.dta

^a Includes only tagged fish and not total captures.

Appendix A2. Recapture numbers (R) and locations from 583 grayling (≥ 180 mm FL) tagged in the Delta Clearwater River at river km 1.6, 21 April through 5 May 1977^a.

Location	Sample Type/Month	1977		1978		1979		1980		1981		1982		1983		1984		1985-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Shaw Creek	SP	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Tanana River/Big D	SP	0	---	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
Delta Clearwater	TE/April	---	---	12	922	1	146	0	68	0	71	0	33	---	---	0	6	0	771	13	2,017
	TE/July	0	101	0	73	4	138	1	175	1	78	0	62	0	174	1	83	0	228	7	1,110
	CC	13	164	7	204	3	227	1	163	0	163	0	101	0	130	0	79	0	1,983	24	3,214
	SP	13	---	21	---	7	---	4	---	2	---	1	---	0	---	0	---	0	---	48	---
Clearwater Lake	SP	6	---	3	---	0	---	0	---	0	---	1	---	0	---	0	---	0	---	10	---
Volkmar River	SP	0	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Dry Creek	SP	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	0	99	12	995	5	284	1	243	1	149	0	95	0	174	1	89	0	999	20	3,127
	CC	13	164	7	204	3	227	1	163	0	163	0	101	0	130	0	79	0	1,983	24	3,214
	SP	21	---	27	---	7	---	4	---	2	---	2	---	0	---	0	---	0	---	63	---
		34		46		15		6		3		2		0		1		0		107	

^a Recaptures are partitioned according to sample type; TE= test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch sampled by Alaska Department of Fish and Game personnel. C is ≥ 150 mm FL in the 1977 samples and ≥ 200 mm FL for subsequent samples

Appendix A3. Recapture numbers (R) and locations from 878 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River at river km 1.6, 18 April through 5 May 1978^a.

Location	Sample Type/Month	1978		1979		1980		1981		1982		1983		1984-1990		Totals	
		R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Richardson	TE/July	0	110	0	60	0	206	0	188	0	352	0	423	0	2,332	0	3,671
Clearwater	SP	1	---	0	---	0	---	1	---	0	---	0	---	0	---	2	---
Shaw Creek mouth	CC	---	---	---	---	---	---	1	468	0	384	0	305	0	960	1	2,117
"	SP	---	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Shaw Creek	SP	0	---	1	---	0	---	0	---	0	---	0	---	0	---	1	---
Caribou Creek	TE/June	---	---	0	11	3	1,291	0	1,384	0	2,335	0	926	0	2,556	3	8,503
Tanana River/Big D	SP	---	---	3	---	1	---	0	---	0	---	0	---	0	---	4	---
Goodpaster River	TE/May	---	---	---	---	---	---	---	---	0	222	---	---	0	1,091	0	1,313
	TE/June	0	621	---	---	0	400	---	---	0	338	---	---	0	5,290	0	6,649
	SP	0	---	0	---	0	---	0	---	0	---	1	---	0	---	1	---
Delta Clearwater	TE/April	---	---	2	146	0	68	0	71	0	33	---	---	0	777	2	1,095
	TE/July	2	73	4	138	2	175	0	78	0	62	0	174	0	309	8	1,009
	CC	19	204	10	227	5	163	1	163	0	101	1	130	0	2,062	36	3,050
	SP	76	---	23	---	18	---	6	---	1	---	1	---	0	---	125	---
Clearwater Lake	SP	13	---	1	---	0	---	0	---	0	---	0	---	0	---	14	---
Totals:	TE	2	804	6	355	5	2,140	0	1,721	0	3,342	0	1,523	0	12,355	13	22,240
	CC	19	204	10	227	5	163	2	631	0	485	1	435	0	3,022	37	5,167
	SP	90	---	28	---	19	---	7	---	1	---	2	---	0	---	147	---
		111		44		29		9		1		3		0		197	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

Appendix A4. Recapture numbers (R) and locations from 139 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River at river km 1.6, 16 April through 3 May 1979^a.

Location	Sample Type/Month	1979		1980		1981		1982		1983		1984		1985		1986-1990		Totals	
		R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/June	---	---	---	---	---	---	---	---	---	---	---	---	0	229	0	2,914	0	3,143
	SP	0	---	0	---	0	---	0	---	2	---	0	---	0	---	0	---	2	---
Tanana at Shaw Cr.	CC/April	---	---	---	---	0	468	1	384	0	305	0	364	0	412	0	184	1	2,117
	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Delta Clearwater	TE/April	---	---	0	68	0	71	0	33	---	---	0	6	0	4	0	767	0	949
	TE/July	1	157	0	175	0	78	0	62	0	174	0	83	1	131	0	102	2	962
	CC/Seas	4	227	1	163	1	163	0	101	1	130	0	79	0	169	0	1,814	7	2,846
	SP	10	---	7	---	2	---	1	---	0	---	0	---	0	---	0	---	20	---
Clearwater Lake	SP	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	1	157	0	243	0	149	0	95	0	174	0	89	1	364	0	3,783	2	5,054
	CC	4	227	1	163	1	631	1	485	1	435	0	443	0	581	0	1,998	8	4,963
	SP	11	---	7	---	2	---	1	---	2	---	0	---	0	---	0	---	23	---
		16		8		3		2		3		0		1		0		33	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

Appendix A5. Recapture numbers (R) and locations from 60 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River at river km 1.6, 11 April through 2 May 1980^a.

Location	Sample Type/Month	1980		1981		1982-1990		Totals	
		R	C ^b	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	1	71	0	810	1	881
	TE/July	1	180	0	78	0	548	1	806
	CC/Seas	2	163	0	163	0	2,293	2	2,619
	SP	4	---	0	---	0	---	4	---
Clearwater Lake	SP	1	---	0	---	0	---	1	---
Totals:	TE	1	180	1	149	0	1,358	2	1,687
	CC	2	163	0	163	0	2,293	2	2,619
	SP	5	---	0	---	0	---	5	---
		8		1		0		9	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A6. Recapture numbers (R) and locations from 68 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River at river km 1.6, 15 April through 1 May 1981^a.

Location	Sample Type/Month	1981		1982		1983		1984-1990		Totals	
		R	C	R	C	R	C	R	C	R	C
Caribou Creek	TE/June	0	1,384	0	2,335	1	926	0	2,556	1	7,201
Delta Clearwater	TE/April	0	71	0	33	---	---	0	777	0	881
	TE/July	0	78	0	62	0	174	0	311	0	625
	CC/Seas	0	163	1	101	0	130	0	2,062	1	2,456
	SP	8	---	2	---	0	---	0	---	10	---
Clearwater Lake	SP	1	---	0	---	0	---	0	---	1	---
Totals:	TE	0	1,533	0	2,430	1	1,100	0	3,644	1	8,707
	CC	0	163	1	101	0	130	0	2,062	1	2,456
	SP	9	---	2	---	0	---	0	---	11	---
		9		3		1		0		13	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

Appendix A7. Recapture numbers (R) and locations from 28 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River at river km 1.6, 21 April through May 1982^a.

Location	Sample Type/Month	1982		1983-1990		Totals	
		R	C ^b	R	C	R	C
Delta Clearwater	TE/April	---	---	0	777	0	777
	TE/July	0	78	0	486	0	564
	CC/Seas	0	163	0	2,192	0	2,355
	SP	3	---	0	---	3	---
Totals:	TE	0	78	0	1,263	0	1,341
	CC	0	163	0	2,192	0	2,355
	SP	3	---	0	---	3	---
		3		0		3	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A8. Recapture numbers (R) and locations from 548 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River at river km 1.6, 3 May through 6 June 1988^a.

Location	Sample Type/Month	1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C
Tanana River/Big D	SP	0	---	0	---	1	---	1	---
Goodpaster River	TE/Aug	4	1,665	1	1,007	1	1,197	6	3,869
"	SP	0	---	0	---	0	---	0	---
Delta Clearwater	TE/Apr	---	---	---	---	---	---	0	0
"	TE/Jul	2	33	---	---	---	---	2	33
"	CC	36	451	26	563	7	411	69	1,425
"	SP	32	---	18	---	19	---	69	---
Clearwater Lake	SP	3	---	0	---	0	---	3	---
Totals:		6	1,698	1	1,007	1	1,197	8	3,902
	CC	36	451	26	563	7	411	69	1,425
	SP	35	---	18	---	20	---	73	---
		77		45		28		150	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A9. Recapture numbers (R) and locations from 28 grayling (≥ 200 mm FL) tagged in the Delta Clearwater River between river km 22 and 27, 12 July 1988^a.

Location	Sample Type/Month	1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C
Goodpaster River	TE/Aug	1	1,665	0	1,007	0	1,197	1	3,869
"	SP	0	---	0	---	0	---	0	---
Delta Clearwater	TE/Apr	---	---	---	---	---	---	0	0
"	TE/Jul	---	---	---	---	---	---	0	0
"	CC	3	451	1	563	0	411	4	1,425
"	SP	0	---	2	---	1	---	3	---
Totals:		TE	1 1,665	0 1,007	0 1,197	1	3,869		
		CC	3 451	1 563	0 411	4	1,425		
		SP	0 ---	2 ---	1 ---	3	---		
			4	3	1	8			

^a Recaptures are partitioned according to sample type; TE = test sampling; CC= creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A10. Recapture numbers (R) and locations from 651 tagged grayling (≥ 200 mm FL) stocked into the Delta Clearwater River at river km 13, 26 September 1979^a.

Location	Sample Type/Month	1979		1980		1981		1982		1983		1984		1985		1986-1990		Totals	
		R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Richardson Clear	TE/June	---	---	0	168	0	188	1	352	0	423	0	324	0	388	0	1,620	1	3,463
	SP	---	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Delta Clearwater	TE/April	---	---	15	68	0	71	0	33	---	---	0	6	0	4	0	767	15	949
	TE/July	---	---	0	175	0	78	0	62	0	174	0	83	1	131	0	102	1	805
	CC/Seas	---	---	4	163	1	163	0	101	1	130	0	79	0	169	0	1,814	6	2,619
	SP	---	---	21	---	3	---	0	---	0	---	0	---	0	---	0	---	24	---
Clearwater Lake	SP	---	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	---	---	15	411	0	337	1	447	0	597	0	413	1	523	0	1,257	17	5,217
	CC	---	---	4	163	1	163	0	101	1	130	0	79	0	169	0	1,814	6	2,619
	SP	---	---	22	---	3	---	0	---	0	---	0	---	0	---	0	---	25	---
		---		41		4		1		1		0		1		0		48	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

Appendix A11. Recapture numbers (R) and locations from 1,039 tagged grayling stocked into the Delta Clearwater River at river km 13, 25 May and 8 June 1984^a.

		1984		1985		1986		1987		1988		1989-1990		Totals		
Location	Sample Type/Month	R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	
Delta Clearwater	TE/April	---	---	0	4	2	169	0	27	1	571	---	---	3	771	
"	TE/July	1	84	0	131	1	40	0	84	0	33	---	---	2	372	
"	CC	0	79	2	169	0	139	0	250	0	451	0	974	2	2,062	
"	SP	6	---	10	---	6	---	0	---	1	---	0	---	23	---	
Clearwater Lake	SP	1	---	2	---	0	---	0	---	0	---	0	---	3	---	
Totals:		TE	1	84	0	135	3	209	0	111	1	604	0	0	5	1,143
		CC	0	79	2	169	0	139	0	250	0	451	0	974	2	2,062
		SP	7	---	12	---	6	---	0	---	1	---	0	---	26	---
			8		14		9		0		2		0		33	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch sampled by Alaska Department of Fish and Game personnel. C is ≥ 150 mm FL for 1984 samples and ≥ 200 mm FL for subsequent samples.

Appendix A12. Recapture numbers (R) and locations from 125 tagged grayling stocked into the Delta Clearwater River at river km 13, 23 September 1984^a.

Location	Sample Type/Month	1984		1985		1986		1987-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	2	4	0	169	0	598	2	771
"	TE/July	---	---	0	126	0	40	0	117	0	283
"	CC	---	---	2	169	0	139	0	1,675	2	1,983
"	SP	---	---	3	---	1	---	0	---	4	---
Totals:		---	---	2	130	0	209	0	715	2	1,054
		---	---	2	169	0	139	0	1,675	2	1,983
		---	---	3	---	1	---	0	---	4	---
		---	---	7	---	1	---	0	---	8	---

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A13. Recapture numbers (R) and locations from 553 tagged grayling stocked into the Delta Clearwater River at river km 13, 14 June 1985^a.

Location	Sample Type/Month	1985		1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
Clear Creek	TE/July	0	46	---	---	---	---	---	---	---	---	---	---	0	46
"	SP	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Goodpastor River	TE/May	0	492	0	294	0	304	---	---	---	---	---	---	0	1,090
"	TE/Aug ^c	0	448	0	300	0	297	0	1,665	0	1,007	0	1,197	0	4,914
"	SP	0	---	0	---	1	---	0	---	0	---	0	---	1	---
Delta Clearwater	TE/April	---	---	8	169	0	27	2	571	---	---	---	---	10	767
"	TE/July	2	131	1	40	0	84	0	33	---	---	---	---	3	288
"	CC	1	169	0	139	1	250	0	451	0	563	0	411	2	1,983
"	SP	2	---	3	---	0	---	1	---	0	---	1	---	7	---
Clearwater Lake	SP	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	2	1,117	9	803	0	712	2	2,269	0	1,007	0	1,197	13	7,105
	CC	1	169	0	139	1	250	0	451	0	563	0	411	2	1,983
	SP	2	---	5	---	1	---	1	---	0	---	1	---	10	---
		5		14		2		3		0		1		25	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch sampled by Alaska Department of Fish and Game personnel. C is ≥ 150 mm FL in 1985 samples and ≥ 200 mm FL for subsequent samples.

^c 1985 includes June (n = 171) and August (n = 277) samples.

Appendix A14. Recapture numbers (R) and locations from 638 tagged grayling stocked into the Delta Clearwater River at river km 13, 3 October 1985^a.

Location	Sample Type/Month	1985		1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	23	169	3	27	1	571	---	---	---	---	27	767
"	TE/July	---	---	1	40	0	84	0	33	---	---	---	---	1	157
"	CC	---	---	3	139	0	250	0	451	0	563	0	411	3	1,814
"	SP	---	---	22	---	1	---	2	---	1	---	2	---	28	---
Totals:		---	---	24	209	3	111	1	604	0	0	0	0	28	924
		---	---	3	139	0	250	0	451	0	563	0	411	3	1,814
		---	---	22	---	1	---	2	---	1	---	2	---	28	---
		---	---	49		4		3		1		2		59	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A15. Recapture numbers (R) and locations from 87 tagged grayling stocked into the Delta Clearwater River at river km 13, 4 September and 3 October 1987^a.

Location	Sample Type/Month	1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	10	571	---	---	---	---	10	571
"	TE/July	---	---	0	33	---	---	---	---	0	33
"	CC	---	---	3	451	0	563	0	411	3	1,425
"	SP	---	---	2	---	1	---	2	---	5	---
Totals:											
	TE	---	---	10	604	0	0	0	0	10	604
	CC	---	---	3	451	0	563	0	411	3	1,425
	SP	---	---	2	---	1	---	2	---	5	---
		---		15		1		2		18	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A16. Recapture numbers (R) and locations from 67 tagged grayling (≥ 200 mm FL) stocked in Clear Creek, 29 August 1979^a.

Location	Sample Type/Month	1980		1981		1982-1990		Totals	
		R	C ^b	R	C	R	C	R	C
Clear Creek	TE/July	0	52	1	40	0	170	1	262
"	SP	0	---	0	---	0	---	0	---
Totals:	TE	0	52	1	40	0	66	1	158
	SP	0	---	0	---	0	---	0	---
		0		1		0		1	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A17. Recapture numbers (R) and locations from 62 grayling (≥ 200 mm FL) tagged in Clear Creek, 28 July 1982^a.

		1982		1983		1984		1985		1986		1987-1990		Totals	
Sample															
Location	Type/Month	R	Cb	R	C	R	C	R	C	R	C	R	C	R	C
Shaw Creek mouth	TE/April	---	---	---	---	---	---	---	---	---	---	0	596	0	596
"	CC/April	---	---	0	281	1	360	0	412	0	184	---	---	1	1,237
"	SP/April	---	---	2	---	1	---	1	---	0	---	---	---	4	---
Shaw Creek	SP	0	---	0	---	0	---	0	---	1	---	0	---	1	---
Caribou Creek	TE/June	---	---	3	926	0	719	0	327	0	710	0	800	3	3,482
Clear Creek	TE/July	---	---	---	---	1	58	1	46	---	---	---	---	2	104
"	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Blue Creek	SP	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Goodpaster River	TE/May	---	---	---	---	---	---	0	492	1	294	0	304	1	1,090
"	TE/Aug ^c	---	---	---	---	0	376	0	448	0	300	0	4,166	0	5,290
"	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Delta Clearwater	TE/April	---	---	---	---	0	6	0	4	0	169	0	598	0	777
"	TE/July	---	---	0	175	0	83	0	131	0	40	0	117	0	546
"	CC	0	101	0	130	0	79	0	169	0	139	0	1,675	0	2,293
"	SP	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Clearwater Lake	SP	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	0	0	3	1,101	1	1,242	1	1,448	1	1,513	0	6,581	6	11,885
	CC	0	101	0	411	1	439	0	581	0	323	0	1,675	1	3,530
	SP	0	---	5	---	1	---	1	---	1	---	0	---	8	---
		0		8		3		2		2		0		15	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c June sample in 1984. 1985 includes June (n = 171) and August (n = 277) samples.

Appendix A18. Recapture numbers (R) and locations from 58 grayling (≥ 200 mm FL) tagged in Clear Creek, 1 August 1984^a.

Location	Sample Type/Month	1984		1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C
Richardson	TE/July	---	---	0	388	0	247	0	514	0	859	0	2,008
Clearwater	SP	0	---	0	---	0	---	0	---	0	---	0	---
"	VOL	0	---	1	---	0	---	0	---	0	---	1	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	1	269	0	327	1	596
"	CC/April	---	---	0	412	2	184	---	---	---	---	2	596
"	SP/April	---	---	2	---	0	---	---	---	---	---	2	---
Shaw Creek	SP	0	---	1	---	0	---	0	---	0	---	1	---
Caribou Creek	TE/June	---	---	1	327	1	710	0	750	0	50	2	1,837
Clear Creek	TE/July	---	---	3	46	---	---	---	---	---	---	3	46
"	SP	0	---	0	---	1	---	0	---	0	---	1	---
Goodpaster River	TE/May	---	---	0	492	0	294	0	304	---	---	0	1,090
	TE/Aug ^c	---	---	1	448	0	300	0	297	0	3,869	1	4,914
	SP	0	---	0	---	0	---	0	---	0	---	0	---
Totals: TE		0	0	5	1,701	1	1,551	1	2,134	0	5,105	7	10,491
CC		---	---	0	412	2	184	---	---	---	---	2	596
SP		0	---	3	---	1	---	0	---	0	---	4	---
VOL		0	---	1	---	0	---	0	---	0	---	1	---
		0		9		4		1		0		14	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample), and; SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c 1985 includes June (n = 171) and August (n = 277) samples.

Appendix A19. Recapture numbers (R) and locations from 33 grayling (≥ 200 mm FL) tagged in the Richardson Clearwater River, 19 June 1980^a.

Location	Sample Type/Month	1980		1981		1982		1983		1984		1985		1986		1987		1988		1989-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Richardson	TE/July	1	168	1	188	2	352	1	423	1	324	1	388	0	247	0	514	1	859	---	---	8	3,463
Clearwater	SP	0	---	0	---	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
"	VOL	0	---	1	---	1	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	3	---
Shaw Creek	TE/April	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	269	0	327	---	---	0	596
mouth	CC/April	---	---	0	468	1	384	1	305	0	364	0	412	0	184	---	---	---	---	---	---	2	2,117
"	SP/April	---	---	1	---	0	---	0	---	0	---	0	---	0	---	---	---	---	---	---	---	1	---
Caribou	TE/June	---	---	0	1,384	4	2,335	0	926	1	719	0	327	0	710	0	750	0	50	---	---	5	7,201
Clear Cr.	TE/July	0	52	0	40	0	66	---	---	0	58	0	46	---	---	---	---	---	---	---	---	0	262
"	SP	0	---	0	---	1	---	---	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	1	220	1	1,612	6	2,753	1	1,349	2	1,101	1	761	0	957	0	1,533	1	1,236	0	0	13	11,522
	CC	---	---	0	468	1	384	1	305	0	364	0	412	0	184	---	---	---	---	---	---	2	2,117
	SP	0	---	1	---	3	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	4	---
	VOL	0	---	1	---	1	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	3	---
		1		3		11		3		2		1		0		0		1		0		22	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A20. Recapture numbers (R) and locations from 749 grayling (≥ 200 mm FL) tagged in the Richardson Clearwater River, 5 through 19 July 1988^a.

Location	Sample Type/Month	1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C
Richardson Clearwater	SP	41	---	7	---	2	---	50	---
	VOL	13	---	11	---	---	---	24	---
Tanana River/Big D	SP/March	0	---	0	---	1	---	1	---
Delta Clearwater	CC	0	451	0	563	0	411	0	1,425
	SP	0	---	0	---	1	---	1	---
Totals:	CC	0	451	0	563	0	411	0	1,425
	SP	41	---	7	---	4	---	52	---
	VOL	13	---	11	---	---	---	24	---
		54		18		4		76	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary creel survey program.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A21. Recapture numbers (R) and locations from 11 grayling (≥ 200 mm FL) tagged in Caribou Creek, 11 September 1979^a.

Location	Sample Type/Month	1980		1981		1982		1983		1984		1985		1986-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Richardson	TE/July	0	206	0	188	0	352	0	423	0	324	0	388	0	1,620	0	3,501
Clearwater	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
"	VOL	0	---	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	---	---	---	---	---	---	0	---	0	0
"	CC/April	---	---	1	468	0	384	0	305	0	364	0	412	0	184	1	2,117
"	SP/April	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Caribou Creek	TE/June	0	1,291	1	1,384	1	2,335	0	926	0	719	0	327	0	1,510	2	8,492
Goodpaster River	TE/May	---	---	---	---	0	222	---	---	---	---	1	492	0	598	1	1,312
	TE/June	0	400	---	---	0	338	---	---	0	376	0	448 ^c	0	4,466 ^d	0	6,028
	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Totals:	TE	0	1,897	1	1,572	1	3,247	0	1,349	0	1,419	1	1,655	0	8,194	3	19,333
	CC	---	---	1	468	0	384	0	305	0	364	0	412	0	184	1	2,117
	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
	VOL	0	---	0	---	1	---	0	---	0	---	0	---	0	---	1	---
		0		2		2		0		0		1		0		5	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c 1985 includes June (n = 171) and August (n = 277) samples.

^d Represents all August test sampling.

Appendix A22. Recapture numbers (R) and locations from 1,284 grayling (≥ 200 mm FL) tagged in Caribou Creek, 15 May through 12 June 1980^a.

Location	Sample Type/Mon	1980		1981		1982		1983		1984		1985		1986		1987		1988		1989-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/July	---	---	---	---	---	---	---	---	---	---	0	229	0	169	0	560	0	542	0	1,643	0	3,143
"	SP	3	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	4	---
5 Mile	TE/July	1	100	---	---	---	---	0	60	---	---	---	---	---	---	---	---	---	---	---	---	1	160
"	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Richardson	TE/July	21	206 ^c	9	188	24	352	14	423	8	324	9	388	1	247	2	514	0	859	---	---	88	3,501
Clearwater	SP	7	---	0	---	12	---	1	---	0	---	0	---	0	---	1	---	1	---	0	---	22	---
"	VOL	41	---	42	---	9	---	5	---	6	---	0	---	1	---	0	---	0	---	0	---	104	---
Shaw Mouth	TE/Apr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4	269	0	327	---	---	4	596
"	CC/Apr	---	---	24	468	17	384	11	305	3	364	5	412	1	184	---	---	---	---	---	---	61	2,117
"	SP/Apr	---	---	60	---	0	---	2	---	2	---	4	---	0	---	---	---	---	---	---	---	68	---
Shaw Creek	SP	4	---	2	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	7	---
Gilles	TE/Jun	---	---	---	---	1	17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	17
Caribou	TE/Jun	---	---	45	1,384	90	2,335	31	926	29	719	3	327	6	710	2	750	0	50	---	---	206	7,201
Clear	TE/Jul	2	52	1	40	1	66	---	---	0	58	0	46	---	---	---	---	---	---	---	---	4	262
"	SP	0	---	0	---	1	---	---	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Tanana	SP/Mar	---	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Delta	TE/Apr	0	68	0	71	0	33	---	---	0	6	0	4	0	169	0	27	0	571	---	---	0	949
Clearwater	TE/Jun	0	175	0	78	0	62	0	174	0	83	0	131	0	40	0	84	0	33	---	---	0	860
"	CC	0	163	1	163	0	101	0	130	0	79	0	169	0	139	0	250	0	451	0	974	1	2,619
"	SP	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
Totals:	TE	24	601	55	1,761	116	2,865	45	1,583	37	1,190	12	1,125	7	1,335	8	2,204	0	2,382	0	1,643	304	16,689
	CC	0	163	25	631	17	485	11	435	3	443	5	581	1	323	0	250	0	451	0	974	62	4,736
	SP	16	---	64	---	14	---	3	---	2	---	4	---	0	---	1	---	1	---	0	---	105	---
	VOL	41	---	42	---	9	---	5	---	6	---	0	---	1	---	0	---	0	---	0	---	104	---
		81		186		156		64		48		21		9		9		1		0		575	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and;

VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c C includes June and July test samples.

Appendix A23. Recapture numbers (R) and locations from 1,309 grayling (≥ 200 mm FL) tagged in Caribou Creek, 6 through 19 June 1981^a.

Location	Sample Type/Month	1981		1982		1983		1984		1985		1986		1987		1988		1989-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Little Salcha	SP	0	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Salcha	TE/June	---	---	---	---	---	---	---	---	0	229	0	169	0	560	0	542	0	1,643	0	3,143
"	SP	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
5 Mile Clearwater	TE/July	---	---	---	---	0	60	---	---	---	---	---	---	---	---	---	---	---	---	0	60
"	SP	3	---	0	---	0	---	1	---	0	---	0	---	0	---	0	---	0	---	4	---
Buchanan Creek	SP	0	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Richardson	TE/July	6	188	19	352	18	423	2	324	4	388	0	247	1	514	3	859	---	---	53	3,295
Clearwater	SP	0	---	12	---	3	---	0	---	0	---	0	---	1	---	0	---	0	---	16	---
"	VOL	51	---	19	---	13	---	5	---	1	---	0	---	0	---	0	---	0	---	89	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	---	---	---	---	---	---	6	269	0	327	---	---	6	596
"	CC/April	---	468	20	384	10	305	7	364	4	412	0	184	---	---	---	---	---	---	41	2,117
"	SP/April	---	---	4	---	8	---	2	---	3	---	0	---	---	---	---	---	---	---	17	---
Shaw Creek	SP	5	---	3	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	8	---
Caribou Creek	TE/June	---	---	221	2,335	86	926	43	719	3	327	6	710	5	750	0	50	---	---	364	5,817
Clear Creek	TE/July	1	40	0	66	---	---	1	58	0	46	---	---	---	---	---	---	---	---	2	210
"	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Tanana River/Big D	SP	---	---	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---

-continued-

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Location	Sample Type/Month	1981		1982		1983		1984		1985		1986		1987		1988		1989-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	0	71	0	33	0	---	0	6	0	4	0	169	0	27	0	571	---	---	0	881
"	TE/July	0	78	0	62	0	174	0	83	0	131	0	40	0	84	0	33	---	---	0	685
"	CC	0	163	0	101	0	130	0	79	0	169	0	139	0	250	0	451	0	974	0	2,456
"	SP	0	---	0	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	7	377	240	2865	104	1583	46	1190	7	1125	6	1335	12	2204	3	2382	0	1643	425	14704
	CC	0	631	20	485	10	435	7	443	4	581	0	323	0	250	0	451	0	974	41	4573
	SP	10	---	23	---	12	---	3	---	3	---	0	---	1	---	0	---	0	---	52	---
	VOL	51	---	19	---	13	---	5	---	1	---	0	---	0	---	0	---	0	---	89	---
		68		302		139		61		15		6		13		3		0		607	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A24. Recapture numbers (R) and locations from 1,991 grayling (≥ 200 mm FL) tagged in Caribou Creek, 2 through 20 June 1982^a.

Location	Sample Type	1982		1983		1984		1985		1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/June	---	---	---	---	---	---	0	229	0	169	0	560	0	542	0	976	0	667	0	3,143
"	SP	6	---	3	---	1	---	0	---	1	---	1	---	0	---	0	---	0	---	12	---
5 Mile Clearwater	TE/July	---	---	0	60	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	60
"	SP	1	---	0	---	0	---	0	---	1	---	0	---	0	---	0	---	0	---	2	---
Richardson	TE/July	29	352	20	423	14	324	11	388	1	247	4	514	3	859	---	---	---	---	82	3,107
Clearwater	SP	18	---	6	---	2	---	4	---	0	---	3	---	1	---	0	---	0	---	34	---
"	VOL	54	---	20	---	7	---	2	---	2	---	0	---	2	---	0	---	---	---	87	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	---	---	---	---	6	269	1	327	---	---	---	---	7	596
"	CC/April	---	384	19	305	12	364	12	412	1	184	---	---	---	---	---	---	---	---	44	1,649
"	SP/April	---	---	20	---	4	---	10	---	0	---	---	---	---	---	---	---	---	---	34	---
Shaw Creek	SP	15	---	0	---	2	---	0	---	1	---	0	---	0	---	0	---	0	---	18	---
Gilles Creek	TE/June	1	17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	17
Caribou Creek	TE/June	---	2,335	105	926	72	719	5	327	13	710	14	750	1	50	---	---	---	---	210	5,817
Clear Creek	TE/July	3	66	---	---	0	58	2	46	---	---	---	---	---	---	---	---	---	---	5	170
"	SP	0	---	0	---	0	---	0	---	1	---	0	---	1	---	1	---	0	---	3	---
Tanana River/Big D	SP	---	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Goodpaster River	TE/May	0	222	---	---	---	---	0	492	0	294	0	305	---	---	---	---	---	---	0	1,313
	TE/JU	0	338	0	---	0	376	0	448 ^c	0	300 ^d	0	297 ^d	1	1,665 ^d	0	1,007 ^d	0	1,197 ^d	1	5,628
	SP	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---

-continued-

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Location	Sample Type	1982		1983		1984		1985		1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	0	33	0	---	0	6	0	4	0	169	0	27	0	571	---	---	---	---	0	810
	TE/July	0	62	1	174	0	83	1	131	0	40	0	84	0	33	---	---	---	---	2	607
	CC	0	101	0	130	1	79	1	169	0	139	1	250	0	451	0	563	0	411	3	2,293
	SP	0	---	2	---	4	---	2	---	1	---	1	---	0	---	0	---	0	---	10	---
Totals:	TE	33	3,425	126	1,583	86	1,566	19	2,065	14	1,929	24	2,806	6	4,047	0	1,983	0	1,864	308	21,268
	CC	0	485	19	435	13	443	13	581	1	323	1	250	0	451	0	563	0	411	47	3,942
	SP	42	0	32	0	13	0	16	0	5	0	5	0	2	0	1	0	0	0	116	0
	VOL	54	---	20	---	7	---	2	---	2	---	0	---	2	---	0	---	---	---	87	---
		129		197		119		50		22		30		10		1		0		558	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c C includes June (n = 171) and August (n = 277) test samples.

^d August test samples only.

Appendix A25. Recapture numbers (R) and locations from 177 grayling (≥ 200 mm FL) tagged in Caribou Creek, 5 through 15 June 1984^a.

Location	Sample Type	1984		1985		1986		1987		1988		1989-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
5 Mile Clearwater	TE/July	---	---	---	---	---	---	---	---	---	---	---	---	0	0
"	SP	1	---	0	---	0	---	0	---	0	---	0	---	1	---
Richardson Clearwater	TE/July	9	324	8	388	1	247	7	514	5	859	---	---	30	2,332
"	SP	3	---	1	---	0	---	3	---	4	---	0	---	11	---
"	VOL	2	---	0	---	0	---	0	---	0	---	0	---	2	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	1	269	1	327	---	---	2	596
"	CC/April	---	364	5	412	1	184	---	---	---	---	---	---	6	956
"	SP/April	---	---	2	---	0	---	---	---	---	---	---	---	2	---
Shaw Creek	SP	0	---	0	---	1	---	0	---	0	---	0	---	1	---
Caribou Creek	TE/June	---	719	5	327	5	710	0	750	0	50	---	---	10	2,556
Tanana River/Big D	SP	---	---	1	---	0	---	0	---	0	---	0	---	1	---
Delta Clearwater	TE/April	0	6	0	4	0	169	0	27	0	571	---	---	0	777
	TE/July	0	83	0	126	0	40	0	84	0	33	---	---	0	366
	CC	0	79	0	169	0	139	0	250	0	451	0	974	0	2,062
	SP	0	---	1	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	9	1,132	13	845	6	1,166	8	1,644	6	1,840	0	0	42	6,627
	CC	0	443	5	581	1	323	0	250	0	451	0	974	6	3,022
	SP	4	0	5	0	1	0	3	0	4	0	0	0	17	0
	VOL	2	---	0	---	0	---	0	---	0	---	0	---	2	---
		15		23		8		11		10		0		67	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A26. Recapture numbers (R) and locations from 316 grayling (≥ 200 mm FL) tagged in Caribou Creek, 5 through 15 June 1985^a.

Location	Sample Type	1985		1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/June	0	229	0	169	0	560	0	542	0	976	0	667	0	3,143
"	SP	1	---	0	---	0	---	0	---	0	---	0	---	1	---
Richardson	TE/July	8	388	2	247	4	514	6	859	---	---	---	---	20	2,008
Clearwater	SP	0	---	2	---	5	---	1	---	0	---	0	---	8	---
"	VOL	0	---	1	---	0	---	0	---	1	---	---	---	2	---
Shaw Creek mouth	TE/Apri	---	---	---	---	4	269	3	327	---	---	---	---	7	596
"	CC/Apri	---	412	1	184	---	---	---	---	---	---	---	---	1	596
"	SP/Apri	---	---	0	---	---	---	---	---	---	---	---	---	0	---
Shaw Creek	SP	0	---	0	---	1	---	0	---	0	---	0	---	1	---
Caribou Creek	TE/June	---	327	16	710	9	750	0	50	---	---	---	---	25	1,837
Tanana River/Big D	SP	---	---	0	---	1	---	0	---	0	---	0	---	1	---
Delta Clearwater	TE/Apri	0	4	0	169	0	27	0	571	---	---	---	---	0	771
	TE/July	0	131	1	40	0	84	0	33	---	---	---	---	1	288
	CC	0	169	0	139	0	250	0	451	0	563	0	411	0	1,983
	SP	0	---	3	---	1	---	0	---	0	---	0	---	4	---
Totals:	TE	8	1,079	19	1,335	17	2,204	9	2,382	0	976	0	667	53	8,643
	CC	0	581	1	323	0	250	0	451	0	563	0	411	1	2,579
	SP	1	---	5	---	8	---	1	---	0	---	0	---	15	---
	VOL	0	---	1	---	0	---	0	---	1	---	---	---	2	---
		9		26		25		10		1		0		71	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A27. Recapture numbers (R) and locations from 54 grayling (≥ 200 mm FL) tagged in Caribou Creek, 18 through 19 July 1985^a.

Location	Sample Type	1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Richardson	TE/July	---	---	0	247	0	514	0	859	0	1,620
Clearwater	SP	0	---	0	---	0	---	0	---	0	---
"	VOL	0	---	2	---	0	---	0	---	2	---
Caribou Creek	TE/June	---	---	3	710	3	750	0	50	6	1,510
Totals:	TE	0	0	3	957	3	1,264	0	909	6	3,130
	SP	0	---	0	---	0	---	0	---	0	---
	VOL	0	---	2	---	0	---	0	---	2	---
		0		5		3		0		8	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A28. Recapture numbers (R) and locations from 653 grayling (≥ 200 mm FL) tagged in Caribou Creek, 2 through 18 June 1986^a.

Location	Sample Type	1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C
Salcha	TE/July	0	169	0	560	0	542	0	976	0	667	0	2,914
"	SP	4	---	2	---	0	---	1	---	0	---	7	---
Richardson	TE/July	8	247	11	514	12	859	---	---	---	---	31	1,620
Clearwater	SP	5	---	5	---	13	---	2	---	0	---	25	---
"	VOL	5	---	2	---	3	---	3	---	---	---	13	---
Shaw Creek mouth	TE/April	---	---	9	269	6	327	---	---	---	---	15	596
"	CC/April	---	184	---	---	---	---	---	---	---	---	0	184
"	SP/April	---	---	---	---	---	---	---	---	---	---	0	---
Shaw Creek	SP	0	---	0	---	1	---	0	---	0	---	1	---
Gilles Creek	TE	---	---	---	---	---	---	---	---	---	---	0	0
Caribou Creek	TE/June	---	710	30	750	0	50	---	---	---	---	30	1,510
Clear Creek	TE/July	---	---	---	---	---	---	---	---	---	---	0	0
"	SP	1	---	1	---	0	---	0	---	0	---	2	---
Tanana River/Big D	SP	0	---	4	---	0	---	0	---	0	---	4	---
Goodpaster River	TE/May	0	294	0	305	---	---	---	---	---	---	0	599
	TE/Aug	0	300	0	297	1	1,665	0	1,007	0	1,197	1	4,466
	SP	0	---	0	---	0	---	0	---	0	---	0	---
Delta Clearwater	TE/April	0	169	0	27	2	571	---	---	---	---	2	767
	TE/July	0	40	0	84	0	33	---	---	---	---	0	157
	CC	0	139	1	250	0	451	0	563	0	411	1	1,814
	SP	0	---	1	---	2	---	0	---	1	---	4	---
Totals:	TE	8	1,929	50	2,806	21	4,047	0	1,983	0	1,864	79	12,629
	CC	0	323	1	250	0	451	0	563	0	411	1	1,998
	SP	10	---	13	---	16	---	3	---	1	---	43	---
	VOL	5	---	2	---	3	---	3	---	---	---	13	---
		23		66		40		6		1		136	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A29. Recapture numbers (R) and locations from 665 grayling (≥ 200 mm FL) tagged in Caribou Creek, 3 through 11 June 1987^a.

Location	Sample Type	1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Salcha	TE/June	0	560	1	542	0	976	0	667	1	2,745
"	SP	0	---	1	---	0	---	0	---	1	---
Richardson	TE/July	16	514	27	859	---	---	---	---	43	1,373
Clearwater	SP	16	---	17	---	1	---	1	---	35	---
"	VOL	2	---	2	---	0	---	---	---	4	---
Shaw Creek mouth	TE/April	---	269	7	327	---	---	---	---	7	596
"	CC/April	---	---	---	---	---	---	---	---	0	0
"	SP/April	---	---	---	---	---	---	---	---	0	---
Shaw Creek	SP	1	---	0	---	0	---	0	---	1	---
Gilles Creek	TE/June	---	---	---	---	---	---	---	---	0	0
Caribou Creek	TE/June	---	750	5	50	---	---	---	---	5	800
Clear Creek	TE/July	---	---	---	---	---	---	---	---	0	0
"	SP	1	---	1	---	1	---	0	---	3	---
Goodpaster River	TE/May	0	304	---	---	---	---	---	---	0	304
	TE/Aug	0	297	0	1,665	0	1,007	0	1,197	0	4,166
	SP	0	---	1	---	0	---	0	---	1	---
Delta Clearwater	TE/April	0	27	2	571	---	---	---	---	2	598
	TE/July	1	84	0	33	---	---	---	---	1	117
	CC	1	250	0	451	1	563	0	411	2	1,675
	SP	0	---	2	---	0	---	0	---	2	---
Totals:		17	2,805	42	4,047	0	1,983	0	1,864	59	10,699
	CC	1	250	0	451	1	563	0	411	2	1,675
	SP	18	---	22	---	2	---	1	---	43	---
	VOL	2	---	2	---	0	---	---	---	4	---
		38		66		3		1		108	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A30. Recapture numbers (R) and locations from 44 grayling (≥ 200 mm FL) tagged in Caribou Creek, 8 through 10 June 1988^a.

Location	Sample Type/Month	1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C
Salcha	TE/June	0	542	1	976	1	667	2	2,185
"	SP	0	---	0	---	0	---	0	---
Richardson	TE/July	4	859	---	---	---	---	4	859
Clearwater	SP	2	---	0	---	0	---	2	---
"	VOL	2	---	0	---	---	---	2	---
Totals:	TE	4	1401	1	976	1	667	6	3044
	SP	2	---	0	---	0	---	2	---
	VOL	2	---	0	---	---	---	2	---
		8		1		1		10	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary creel survey program.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A31. Recapture numbers (R) and locations from 144 grayling (≥ 200 mm FL) tagged in the lower 9.6 km of Shaw Creek, 17 September through 1 October 1979^a.

Location	Sample Type/Month	1980		1981		1982		1983		1984		1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Richardson	TE/July	0	206	1	188	1	352	1	423	0	324	0	388	0	247	0	514	0	859	3	3,501
Clearwater	SP	0	---	0	---	1	---	0	---	0	---	0	---	0	---	1	---	0	---	2	---
"	VOL	1	---	0		2	---	0	---	0	---	0	---	0	---	0	---	0	---	3	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	---	---	---	---	---	---	0	---	0	269	0	327	0	596
"	CC/April	---	---	1	468	1	384	1	305	0	364	0	412	0	184	---	---	---	---	3	2,117
"	SP/April	0	---	2	---	0	---	0	---	0	---	0	---	0	---	---	---	---	---	2	---
Shaw Creek	SP	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Caribou Creek	TE/June	2	1,291	2	1,384	2	2,335	1	926	0	719	0	327	0	710	0	750	0	50	7	8,492

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Location	Sample Type/Month	1980		1981		1982		1983		1984		1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Tanana River/Big D	SP/March	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
Delta Clearwater	TE/April	1	68	0	71	0	33	---	---	0	6	0	4	0	169	0	27	0	571	1	949
	TE/July	0	175	0	78	0	62	0	174	0	83	0	131	0	40	0	84	0	33	0	860
	CC	0	163	0	163	0	101	0	130	0	79	0	169	0	139	0	250	0	1,425	0	2,619
	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Totals:	TE	3	1,740	3	1,721	3	2,782	2	1,523	0	1,132	0	850	0	1,166	0	1,644	0	1,840	11	14,398
	CC	0	163	1	631	1	485	1	435	0	443	0	581	0	323	0	250	0	1,425	3	4,736
	SP	3	---	2	---	1	---	0	---	0	---	0	---	0	---	1	---	0	---	7	---
	VOL	1	---	0	---	2	---	0	---	0	---	0	---	0	---	0	---	0	---	3	---
		7		6		7		3		0		0		0		1		0		24	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A32. Recapture numbers (R) and locations from 99 grayling (≥ 200 mm FL) tagged in the lower 9.6 km of Shaw Creek, 14 May through 16 June 1980^a.

Location	Sample Type/Month	1980		1981		1982		1983		1984		1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/July	---	---	---	---	---	---	---	---	---	---	0	229	0	169	0	560	0	2,185	0	3,143
"	SP	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
5 Mile Clearwater	TE/July	0	100	---	---	---	---	0	60	---	---	---	---	---	---	---	---	---	---	0	160
	SP	0	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Richardson	TE/July	1	206	1	188	1	352	1	423	0	324	0	388	0	247	0	514	0	859	4	3,501
Clearwater	SP	0	---	0	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
"	VOL	1	---	2	---	1	---	1	---	0	---	0	---	1	---	0	---	0	---	6	---
Shaw Creek mouth	TE/April	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	269	0	327	0	596
"	CC/April	---	---	2	468	1	384	1	305	0	364	0	412	0	184	---	---	---	---	4	2,117
"	SP/April	---	---	3	---	0	---	1	---	0	---	0	---	0	---	---	---	---	---	4	---
Shaw Creek	SP	0	---	1	---	1	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
Gilles Creek	TE/June	---	---	---	---	1	17	---	---	---	---	---	---	---	---	---	---	---	---	1	17
Caribou Creek	TE/June	3	1,291	5	1,384	5	2,335	2	926	1	719	0	327	0	710	1	750	0	50	17	8,492
Clear Creek	TE/July	0	52	0	40	0	66	---	---	0	58	0	46	---	---	---	---	---	---	0	262
"	SP	1	---	0	---	0	---	---	---	0	---	0	---	0	---	0	---	0	---	1	---
Tanana River/Big D	SP/March	---	---	2	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	2	---
Delta Clearwater	TE/April	0	68	0	71	0	33	---	---	0	6	0	4	0	169	0	27	0	571	0	949
	TE/July	0	175	0	78	0	62	0	174	0	83	0	131	0	40	0	84	0	33	0	860
	CC	0	163	0	163	1	101	0	130	0	79	0	169	0	139	0	250	0	1,425	1	2,619
	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Totals:	TE	4	1,892	6	1,761	7	2,865	3	1,583	1	1,190	0	1,125	0	1,335	1	2,204	0	4,025	22	17,980
	CC	0	163	2	631	2	485	1	435	0	443	0	581	0	323	0	250	0	1,425	5	4,736
	SP	2	---	7	---	2	---	1	---	0	---	0	---	0	---	0	---	0	---	12	---
	VOL	1	---	2	---	1	---	1	---	0	---	0	---	1	---	0	---	0	---	6	---
		7		17		12		6		1		0		1		1		0		45	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A33. Recapture numbers (R) and locations from 231 grayling (≥ 200 mm FL) tagged in the Tanana River within 1 km of the mouth of Shaw Creek, 15 through 23 April 1987^a.

Location	Sample Type	1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Salcha	TE/June	1	560	0	542	0	976	0	667	1	2,745
"	SP	0	---	0	---	0	---	0	---	0	---
Richardson	TE/July	19	514	19	859	---	---	---	---	38	1,373
Clearwater	SP	9	---	9	---	2	---	0	---	20	---
"	VOL	1	---	4	---	0	---	---	---	5	---
Shaw Creek mouth	TE/April	---	---	9	327	---	---	---	---	9	327
Shaw Creek	SP	0	---	1	---	0	---	0	---	1	---
Caribou Creek	TE/June	4	750	0	50	---	---	---	---	4	800
Tanana River/Big D	SP	---	---	1	---	0	---	1	---	2	---
Goodpaster River	TE/May	1	317	---	---	---	---	---	---	1	317
"	SP	0	---	0	---	0	---	0	---	0	---
Delta Clearwater	TE/April	0	27	0	571	---	---	---	---	0	598
"	TE/July	0	84	0	33	---	---	---	---	0	117
"	CC	1	250	1	451	0	563	0	411	2	1,675
"	SP	0	---	0	---	0	---	0	---	0	---
Totals:	TE	25	2,252	28	2,382	0	976	0	667	53	6,277
	CC	1	250	1	451	0	563	0	411	2	1,675
	SP	9	---	11	---	2	---	1	---	23	---
	VOL	1	---	4	---	0	---	---	---	5	---
		36		44		2		1		83	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A34. Recapture numbers (R) and locations from 297 grayling (≥ 200 mm FL) tagged in the Tanana River within 1.6 km of the mouth of Shaw Creek, 18 through 22 April 1988^a.

Location	Sample Type	1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C
Richardson	TE/July	12	859	---	---	---	---	12	859
Clearwater	SP	11	---	0	---	0	---	11	---
"	VOL	1	---	3	---	---	---	4	---
Shaw Creek	SP	1	---	1	---	0	---	2	---
Tanana River/Big D	SP	0	---	1	---	0	---	1	---
Goodpaster River	TE/Aug	0	1,665	0	1,007	0	1,197	0	3,869
"	SP	0	---	1	---	0	---	1	---
Delta Clearwater	TE/Apr-May	0	571	---	---	---	---	0	571
"	TE/July	0	33	---	---	---	---	0	33
"	CC	0	451	0	563	0	411	0	1,425
"	SP	0	---	1	---	0	---	1	---
Totals:		TE	12 3,128	0 1,007	0 1,197	0 1,197	12 5,332		
		CC	0 451	0 563	0 411	0 411	0 1,425		
		SP	12 ---	4 ---	0 ---	0 ---	16 ---		
		VOL	1 ---	3 ---	---	---	4 ---		
			25	7	0	32			

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary creel survey program.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A35. Recapture numbers (R) and locations from 22 grayling (≥ 200 mm FL) tagged in Rapids Creek, 17 through 19 May 1979^a.

Location	Sample Type	1979		1980		1981		1982-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Richardson	TE/July	0	60	0	206	0	353	0	3,107	0	3,666
Clearwater	SP	0	---	0	---	0	---	0	---	0	---
"	VOL	0	---	1	---	0	---	0	---	1	---
Tanana at Shaw	CC/April	---	---	---	---	0	468	0	1,649	0	2,117
"	SP/April	---	---	---	---	1	---	0	---	1	---
Shaw Creek	TE	0	---	1	160	0	---	0	---	1	160
Totals:	TE	0	60	1	366	0	353	0	3,107	1	3,826
	CC	---	---	---	---	0	468	0	1,649	0	2,117
	SP	0	---	0	---	1	---	0	---	1	---
	VOL	0	---	1	---	0	---	0	---	1	---
		0		2		1		0		3	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A36. Recapture numbers (R) and locations from 11 grayling (≥ 200 mm FL) tagged in Rapids Creek, 4 June 1982^a.

Location	Sample Type/Month	1982		1983		1984-1990		Totals	
		R	C ^b	R	C	R	C	R	C
Rapids Creek	TE	---	---	1	109	---	---	1	109
Totals:	TE	---	---	1	109	---	---	1	109

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A37. Recapture numbers (R) and locations from 108 grayling (≥ 200 mm FL) tagged in Rapids Creek, 23 through 25 May 1983^a.

Location	Sample Type	1983		1984		1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/June	---	---	---	---	0	229	0	169	0	560	0	2,185	0	3,143
"	SP	0	---	0	---	0	---	0	---	1	---	0	---	1	---
Richardson	TE/July	0	423	0	324	0	388	0	247	0	514	0	1,373	0	3,269
Clearwater	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---
"	VOL	0	---	2	---	0	---	0	---	0	---	0	---	2	---
Shaw Creek mouth	TE/Apri	---	---	---	---	---	---	---	---	0	269	0	327	0	596
"	CC/Apri	---	---	2	364	2	412	0	184	---	---	---	---	4	960
"	SP/Apri	---	---	---	---	1	---	0	---	---	---	---	---	1	---
Totals:	TE	0	423	0	324	0	617	0	416	0	1,343	0	3,885	0	7,008
	CC	---	---	2	364	2	412	0	184	---	---	---	---	4	960
	SP	0	---	0	---	1	---	0	---	1	---	0	---	2	---
	VOL	0	---	2	---	0	---	0	---	0	---	0	---	2	---
		0		4		3		0		1		0		8	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A38. Summary of recapture numbers (R) and locations from 115 grayling (≥ 200 mm FL) tagged in the lower 9.6 km of the Goodpaster River, 19 May 1982^a.

Location	Sample Type	1982		1983		1984		1985		1986		1987		1988-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Richardson	TE/July	0	352	0	423	0	324	0	388	0	247	0	514	0	859	0	3,107
Clearwater	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---	0	---
"	VOL	1	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
Caribou Creek	TE/June	0	2,335	1	926	0	719	0	327	0	710	0	750	0	50	1	5,817
Tanana River/Big D	SP	---	---	0	---	0	---	0	---	0	---	1	---	0	---	1	---
Goodpaster River	TE/May	---	---	---	---	---	---	3	492	0	294	0	304	---	---	3	1,090
	TE/JU	4	338	0	---	0	376	1	448 ^c	2	300 ^d	0	297 ^d	0	3,869 ^d	7	5,628
	SP	1	---	0	---	0	---	0	---	0	---	1	---	0	---	2	---
Delta Clearwater	TE/April	---	---	0	---	0	6	0	4	0	169	0	27	0	571	0	777
	TE/July	0	62	1	175	0	83	0	131	0	40	0	84	0	33	1	608
	CC	0	101	0	130	0	79	0	169	0	139	0	250	0	1,425	0	2,293
	SP	3	---	1	---	0	---	0	---	0	---	0	---	0	---	4	---
Totals:	TE	4	3,087	2	1,524	0	1,508	4	1,790	2	1,760	0	1,976	0	5,382	12	17,027
	CC	0	101	0	130	0	79	0	169	0	139	0	250	0	1,425	0	2,293
	SP	4	---	1	---	0	---	0	---	0	---	2	---	0	---	7	---
	VOL	1	---	0	---	0	---	0	---	0	---	0	---	0	---	1	---
		9		3		0		4		2		2		0		20	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c Includes June (n = 171) and August (n = 277) samples.

^d August sampling only.

Appendix A39. Recapture numbers (R) and locations from 409 grayling (≥ 200 mm FL) tagged in the lower 9.6 km of the Goodpaster River, 21 through 23 May 1985^a.

Location	Sample Type	1985		1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
Salcha	TE/June	0	229	0	169	0	560	0	542	0	976	0	667	0	3,143
"	SP	1	---	0	---	0	---	0	---	0	---	0	---	1	---
Richardson	TE/July	1	388	0	247	0	514	0	859	---	---	---	---	1	2,008
Clearwater	SP	1	---	0	---	0	---	0	---	0	---	0	---	1	---
"	VOL	0	---	1	---	0	---	0	---	0	---	---	---	1	---
Clear Creek	TE/July	1	46	---	---	---	---	---	---	---	---	---	---	1	46
"	SP	0	---	0	---	0	---	0	---	0	---	0	---	0	---
Goodpaster River	TE/May	---	---	8	294	2	304	---	---	---	---	---	---	10	598
	TE/Aug ^c	13	448	2	300	0	297	4	1,665	2	1,007	2	1,197	23	4,914
	SP	2	---	5	---	2	---	2	---	0	---	1	---	12	---
Delta Clearwater	TE/April	---	---	0	169	0	27	0	571	---	---	---	---	0	767
	TE/July	1	131	1	40	1	84	0	33	---	---	---	---	3	288
	CC	0	169	3	139	2	250	0	451	0	563	0	411	5	1,983
	SP	4	---	2	---	3	---	2	---	0	---	0	---	11	---
Totals:	TE	16	1,242	11	1,219	3	1,789	4	3,670	2	1,983	2	1,864	38	11,767
	CC	0	169	3	139	2	250	0	451	0	563	0	411	5	1,983
	SP	8	---	7	---	5	---	4	---	0	---	1	---	25	---
	VOL	0	---	1	---	0	---	0	---	0	---	---	---	1	---
		24		22		10		8		2		3		69	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

^c 1985 includes June and August samples.

Appendix A40. Recapture numbers (R) and locations from 272 grayling (≥ 200 mm FL) tagged in the lower 9.6 km of the Goodpaster River, 15 through 17 May 1986^a.

Location	Sample Type	1986		1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C
Salcha	TE/June	0	169	0	560	0	542	0	976	0	667	0	2,914
"	SP	1	---	0	---	0	---	0	---	0	---	1	---
Richardson	TE/July	0	247	0	514	0	859	---	---	---	---	0	1,620
Clearwater	SP	1	---	1	---	0	---	0	---	0	---	2	---
"	VOL	0	---	0	---	0	---	0	---	---	---	0	---
Clear Creek	TE/July	---	---	---	---	---	---	---	---	---	---	0	0
"	SP	0	---	0	---	0	---	1	---	0	---	1	---
Tanana River/Big D	SP	0	---	1	---	0	---	0	---	0	---	1	---
Goodpaster River	TE/May	---	---	5	304	---	---	---	---	---	---	5	304
	TE/Aug	3	300	3	297	7	1,665	4	1,007	0	1,197	17	4,466
	SP	4	---	1	---	0	---	0	---	0	---	5	---
Delta Clearwater	TE/April	---	---	0	27	1	571	---	---	---	---	1	598
	TE/July	0	40	0	84	0	33	---	---	---	---	0	157
	CC	0	139	2	250	0	451	0	563	0	411	2	1,814
	SP	1	---	1	---	0	---	1	---	2	---	5	---
Totals:	TE	3	756	8	1,786	8	3,670	4	1,983	0	1,864	23	10,059
	CC	0	139	2	250	0	451	0	563	0	411	2	1,814
	SP	7	---	4	---	0	---	2	---	2	---	15	---
	VOL	0	---	0	---	0	---	0	---	---	---	0	---
		10		14		8		6		2		40	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A41. Recapture numbers (R) and locations from 292 grayling (≥ 200 mm FL) tagged in the lower 9.6 km of the Goodpaster River, 12 through 13 May 1987^a.

Location	Sample Type	1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Richardson	TE/July	3	514	2	859	---	---	---	---	5	1,373
Clearwater	SP	1	---	1	---	0	---	0	---	2	0
"	VOL	0	---	0	---	0	---	---	---	0	---
Clear Creek	TE/July	---	---	---	---	---	---	---	---	0	0
"	SP	1	---	0	---	0	---	0	---	1	---
Tanana River/Big D	SP	0	---	0	---	0	---	0	---	0	---
Goodpaster River	TE/May	---	---	---	---	---	---	---	---	---	---
	TE/AUG	1	297	6	1,665	4	1,007	0	1,197	11	4,166
	SP	7	---	1	---	0	---	0	---	8	---
Delta Clearwater	TE/Apri	---	---	0	571	---	---	---	---	0	571
	TE/July	0	84	1	33	---	---	---	---	1	117
	CC	1	250	1	451	3	563	0	411	5	1,675
	SP	1	---	0	---	1	---	4	---	6	---
Totals:	TE	4	895	9	3,128	4	1,007	0	1,197	17	6,227
	CC	1	250	1	451	3	563	0	411	5	1,675
	SP	10	---	2	---	1	---	4	---	17	---
	VOL	0	---	0	---	0	---	---	---	0	---
		15		12		8		4		39	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A42. Recapture numbers (R) and locations from 292 grayling (≥ 200 mm FL) tagged in the lower 53 km of the Goodpaster River, 4 through 10 August 1987^a.

Location	Sample Type	1987		1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Blue Creek	SP	0	---	0	---	1	---	0	---	1	---
Goodpaster River	TE/AUG	---	---	26	2,011	21	1,819	6	1,534	53	5,364
"	SP	2	---	4	---	3	---	1	---	10	---
Totals:	TE	---	---	26	2,011	21	1,819	6	1,534	53	5,364
	SP	2	---	4	---	4	---	1	---	11	---
		2		30		25		7		64	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A43. Recapture numbers (R) and locations from 1,942 grayling (≥ 150 mm FL) tagged in the lower 53 km of the Goodpaster River, 8 through 18 August 1988^a.

Location	Sample Type/Month	1988		1989		1990		Totals	
		R	C ^b	R	C	R	C	R	C
Salcha	TE/June	---	---	0	1,120	0	887	0	2,007
"	SP	0	---	0	---	1	---	1	---
Goodpaster River	TE/AUG	---	---	150	1,819	67	1,534	217	3,353
	SP	9	---	37	---	9	---	55	---
Delta Clearwater	TE/April	---	---	---	---	---	---	0	0
	TE/July	---	---	---	---	---	---	0	0
	CC	---	---	7	563	1	411	8	974
	SP	0	---	2	---	6	---	8	---
Totals:	TE	0	0	150	2,939	67	2,421	217	5,360
	CC	---	---	7	563	1	411	8	974
	SP	9	---	39	---	16	---	64	---
		9		196		84		289	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns.

^b C = total initial catch (≥ 150 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A44. Recapture numbers (R) and locations from 1,642 grayling (≥ 150 mm FL) tagged in the lower 53 km of the Goodpaster River, 8 through 17 August 1989^a.

Location	Sample Type	1989		1990		Totals	
		R	C ^b	R	C	R	C
Salcha	TE/June	---	---	1	887	1	887
"	SP	0	---	1	---	1	---
Tanana at Shaw Cr.	SP	0	---	1	---	1	---
Tanana at Big Delta	SP	---	---	1	---	1	---
Goodpaster River	TE/AUG	---	---	96	1,534	96	1,534
	SP	10	---	7	---	17	---
Delta Clearwater	CC	---	---	2	411	2	411
"	SP	0	---	3	---	3	---
Totals:		0	0	97	2,832	97	2,832
	CC	---	---	2	411	2	411
	SP	10	---	13	---	23	---
		10		112		122	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC= creel survey (harvest sample); SP = angler returns.

^b C = total initial catch (≥ 150 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A45. Recapture numbers (R) and locations from 113 grayling (≥ 200 mm FL) tagged in the lower 6 km of the Volkmar River, 27 through 29 May 1980^a.

Location	Sample Type/Month	1980		1981		1982		1983		1984-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	0	71	0	33	---	---	0	777	0	881
	TE/July	0	175	0	78	0	62	0	174	0	371	0	860
	CC	1	163	1	163	0	101	0	130	0	2,062	2	2,619
	SP	7	---	1	---	1	---	2	---	0	---	11	---
Clearwater Lake	SP	1	---	0	---	0	---	0	---	0	---	1	---
Totals:	TE	0	175	0	149	0	95	0	174	0	---	0	1,741
	CC	1	163	1	163	0	101	0	130	0	---	2	2,619
	SP	8	---	1	---	1	---	2	---	0	---	12	---
		9		2		1		2		0		14	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A46. Recapture numbers (R) and locations from 50 grayling (≥ 200 mm FL) tagged in the lower 6 km of the Volkmar River, 19 through 22 May 1981^a.

Location	Sample Type/Month	1981		1982		1983		1984-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	0	33	---	---	0	777	0	810
	TE/July	0	78	0	62	0	174	0	371	0	685
	CC	0	163	0	101	0	130	0	2,062	0	2,456
	SP	1	---	0	---	1	---	0	---	2	---
Volkmar River	TE/Sept	2	160	0	---	0	---	0	---	2	160
Totals:	TE	2	238	0	95	0	174	0	1,148	2	1,655
	CC	0	163	0	101	0	130	0	2,062	0	2,456
	SP	1	---	0	---	1	---	0	---	2	---
		3		0		1		0		4	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A47. Recapture numbers (R) and locations from 149 grayling (≥ 200 mm FL) tagged in the lower 6 km of the Volkmar River, 14 through 15 September 1981^a.

Location	Sample Type/Month	1981		1982		1983		1984		1985		1986-1990		Totals	
		R	C ^b	R	C	R	C	R	C	R	C	R	C	R	C
Delta Clearwater	TE/April	---	---	0	33	---	---	0	6	0	4	0	767	0	810
	TE/July	---	---	0	62	0	174	0	83	1	131	0	157	1	607
	CC	---	---	1	101	1	130	0	79	0	169	0	1,815	2	2,294
	SP	---	---	1	---	1	---	2	---	1	---	0	---	5	---
Volkmar River	SP	---	---	0	---	1	---	1	---	0	---	0	---	2	---
Totals:	TE	---	---	0	95	0	174	0	89	1	135	0	924	1	1,417
	CC	---	---	1	101	1	130	0	79	0	169	0	1,815	2	2,294
	SP	---	---	1	---	2	---	3	---	1	---	0	---	7	---
				2		3		3		2		0		10	

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns, and; VOL = voluntary angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A48. Recapture numbers (R) and locations from 8 grayling (≥ 200 mm FL) tagged in the Tanana River within the 8 km downstream of the Richardson Highway bridge at Big Delta, 15 April 1980^a.

Location	Sample Type/Month	1980		1981		1982-1990		Totals	
		R	C ^b	R	C	R	C	R	C
Tanana at Shaw Cr.	SP	0	---	1	---	0	---	1	---
Totals:	SP	0	---	1	---	0	---	1	---

^a Recaptures are partitioned according to sample type; TE = test sampling; CC = creel survey (harvest sample); SP = angler returns.

^b C = total initial catch (≥ 200 mm FL) sampled by Alaska Department of Fish and Game personnel.

Appendix A49. Numbers of grayling in the initial catch and the new marks released from test sampling in four spring fed systems; the Delta Clearwater River, Richardson Clearwater River, Clear Creek, and 5-Mile Clearwater River, 1977 through 1988.

Location	Sample	Year	Period	Catch				Mark Released			
				Total ^a	150-199	200-269	>269	Total	150-199	200-269	>269
Delta Clearwater	Creel	1977	5/15-9/05	164	16	45	103	0	---	---	---
"	"	1978	5/15-9/05	205	1	46	158	0	---	---	---
"	"	1979	5/15-9/05	230	3	91	136	0	---	---	---
"	"	1980	5/15-9/05	167	4	74	89	0	---	---	---
"	"	1981	5/15-9/05	164	1	78	85	0	---	---	---
"	"	1982	5/15-9/05	101	0	29	72	0	---	---	---
"	"	1983	5/15-9/05	131	1	33	97	0	---	---	---
"	"	1984	5/15-9/05	79	0	41	68	0	---	---	---
"	"	1985	5/15-9/15	172	3	34	135	0	---	---	---
"	"	1986	5/15-8/30	139	0	19	120	0	---	---	---
"	"	1987	6/01-9/01	260	10	17	233	0	---	---	---
"	"	1988	6/01-9/01	451	0	5	446	0	---	---	---
"	"	1989	6/01-9/01	563	0	39	524	0	---	---	---
Delta Clearwater	Creel	1990	6/01-8/15	411	0	6	405	0	---	---	---
Sub Totals:				3,237	39	557	2,671				

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Location	Sample	Gear ^b	Year	Period	Catch				Mark Released			
					Total	150-199	200-269	>269	Total	150-199	200-269	>269
Delta Clearwater	Spring Test	FT	1977	April	1,292	190	481	54	583 ^c	48	481	54
"	"	"	1978	"	1,690	321	778	144	878	1	746	131
"	"	"	1979	"	1,016	228	130	16	139	0	124	15
"	"	"	1980	"	545	157	62	6	60	0	55	5
"	"	"	1981	"	1,250	365	70	1	68	0	67	1
"	"	"	1982	April	291	36	29	4	28	0	24	4
"	"	"	1984	April	1,566	137	6	0	0	---	---	---
"	"	"	1985	"	248	31	4	0	0	---	---	---
"	"	"	1986	"	3,204	201	162	7	0	---	---	---
"	"	"	1987	April	1,779	124	27	0	0	---	---	---
Delta Clearwater	Spring Test	"/EB	1988	Apr/May	803	22	214	357	548	0	206	342
Sub Totals:					13,684	1,812	1,963	589	2,304	49	1,703	552
Delta Clearwater	Test	EB	1977	7/06-7/07	101	9	39	53	0	---	---	---
"	"	"	1978	7/10-7/11	87	13	38	35	0	---	---	---
"	"	"	1979	7/17-7/18	153	15	32	106	0	---	---	---
"	"	"	1980	7/15-7/16	182	6	52	123	0	---	---	---
"	"	"	1981	7/07-7/08	85	7	14	64	0	---	---	---
"	"	"	1982	7/15-7/16	63	1	17	45	0	---	---	---
"	"	"	1983	7/12-7/18	175	1	9	165	0	---	---	---
"	"	"	1984	7/09-7/10	84	1	2	81	0	---	---	---
"	"	"	1985	7/08-7/15	136	2	0	131	0	---	---	---
"	"	"	1986	7/07-7/17	41	1	12	28	0	---	---	---
"	"	"	1987	7/06-7/16	91	7	19	65	0	---	---	---
Delta Clearwater	Test	"	1988	7/15-7/17	36	2	2	31	28	0	0	28
Sub Totals:					893	28	127	733	28	0	0	28

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Location	Sample	Gear	Year	Period	Catch				Mark Released			
					Total	150-199	200-269	>269	Total	150-199	200-269	>269
Delta Clearwater	Stocking	---	1979	9/20	NA	---	---	---	651	0	651	0
"	"	---	1984	5/30-6/5	NA	---	---	---	1,039	1,039	0	0
"	"	---	1984	9/15	NA	---	---	---	125	0	125	0
"	"	---	1985	6/15	NA	---	---	---	553	553	0	0
"	"	---	1985	10/2	NA	---	---	---	647	0	647	0
Delta Clearwater	Stocking	---	1987	8/30-9/15	NA	---	---	---	90	3	81	6
Sub Totals:									3,105	1,595	1,504	6
Richardson Clear	Test	EB	1978	July	117	7	55	55	0	---	---	---
"	"	"	1979	July	63	3	20	40	0	---	---	---
"	"	"	1980	June	40	0	0	40	33	0	0	33
"	"	"	1980	July	170	2	28	138	0	---	---	---
"	"	"	1981	July	193	5	43	145	0	---	---	---
"	"	"	1982	July	354	2	50	266	0	---	---	---
"	"	"	1983	July	425	2	NA	NA	0	---	---	---
"	"	"	1984	July	325	1	NA	NA	0	---	---	---
"	"	"	1985	July	393	5	32	342	0	---	---	---
"	"	"	1986	July	247	0	31	215	0	---	---	---
"	"	"	1987	July	516	2	95	418	0	---	---	---
Richardson Clear	Test	"	1988	July	861	2	125	734	749	0	120	629
Sub Totals:					3,704	31	479	2,393	782	0	120	662

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Location	Sample	Gear	Year	Period	Catch				Mark Released			
					Total	150-199	200-269	>269	Total	150-199	200-269	>269
Clear Creek	Test	HL	1979	August	39	2	30	7	0	---	---	---
"	Stocking	---	1979	September	NA	---	---	---	67	0	67	0
"	Test	HL/S	1980	July	53	1	36	16	0	---	---	---
"	"	HL	1981	"	43	2	14	26	0	---	---	---
"	"	"	1982	"	66	0	13	53	62	0	13	49
"	"	"	1984	August	60	2	19	39	58	2	19	37
Clear Creek	Test	"	1985	"	46	0	6	40	0	---	---	---
Sub Totals:					307	7	118	181	187	2	99	86
5-Mile Clearwater	Test	HL	1980	August	100	NA	NA	NA	0	---	---	---
"	Test	"	1983	"	60	NA	NA	NA	0	---	---	---
Sub Totals:					160	---	---	---	0	---	---	---

- ^a Totals may not equal sum of strata due to missing lengths and/or fish less than minimum length.
- ^b Gear type: FT = fyke trap; EB = electrofishing boat; W = weir trap; HL = hook and line; S = seine.
- ^c Minimum length for tagging was 180 mm FL.

Appendix A50. Numbers of grayling in the initial catch and the new marks released from test sampling in two bog fed systems in the mid Tanana River drainage; the Shaw Creek drainage^a and the Volkmar River, 1979 through 1988.

Location	Sample	Gear ^b	Year	Period	Catch				Mark Released			
					Total ^c	150-199	200-269	>269	Total ^b	150-199	200-269	>269
Shaw Creek	Test	HL/EB	1979	Sept	144	0	103	41	144	0	103	41
"	"	HL	1980	May	102	0	72	30	99	0	69	30
	Total				246	0	175	71	243	0	172	71
Caribou Creek	Test	W	1979	Sept	11	0	11	0	11	0	11	0
"	"	"	1980	June	1,571	76	394	897	1,284	0	387	897
"	"	"	1981	"	2,106	133	744	640	1,309	0	714	595
"	"	"	1982	"	3,722	228	930	1,405	1,991	0	858	1,133
"	"	"	1983	"	1,676	24	147	779	924 ^d	0	145	679
"	"	W/S	1984	"	1,183	114	87	632	177	0	16	161
"	"	W/S	1985	June	515	79	135	192	316	0	135	180
"	"	W/HL	1985	July	87	16	57	12	54	0	43	11
"	"	W/S	1986	June	816	82	343	367	653	0	337	316
"	"	"	1987	"	936	72	407	343	665	0		
Caribou Creek	Test	"	1988	"	50	0	13	37	44	0	11	33
	Total				12,673	824	3,268	5,304	7,428	0	2,657	4,005

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Location	Sample	Gear	Year	Period	Catch				Mark Released			
					Total	150-199	200-269	>269	Total ^b	150-199	200-269	>269
Rapids Creek	Test	HL	1979	May	22	0	12	10	22	0	12	10
"	"	"	1982	"	11	0	6	5	11	0	6	5
Rapids Creek	Test	"	1983	"	120	11	68	41	108	0	67	41
Total					153	11	86	56	141	0	85	56
Gilles Creek	Test	HL	1982	June	17	0	6	11	0	---	---	---
Volkmar River	Test	HL	1980	June	118	0	46	72	113	0	45	68
"	"	"	1981	June	65	11	19	33	50	0	17	33
Volkmar River	Test	"/FT	1981	Sept	198	16	99	61	149	0	89	60
Total					381	27	164	166	312	0	151	161

^a Mainstem, Caribou, Rapids, and Gilles creeks.

^b Gear type: FT = fyke trap; EB = electrofishing boat; W = weir trap; HL = hook and line; S = seine.

^c Totals may not equal sum of strata due to missing lengths and/or fish less than minimum length.

^d All captured were marked with fin clips instead of tags.

Appendix A51. Numbers of grayling in the initial catch and the new marks released from test sampling in a two rapid run-off rivers in the mid Tanana River drainage: the Goodpaster and Salcha rivers, 1979 through 1990.

Location	Sample ^a	Year	Period	Catch				Mark Released				
				Total ^b	150-199	200-269	>269	Total	150-199	200-269	>269	
Goodpaster River	Egg Take	1982	May	259	20	92	130	115	0	74	41	
"	"	1985	"	518	16	200	292	409	0	124	285	
"	"	1986	"	360	52	115	179	272	0	106	166	
"	Egg Take	1987	May	317	12	46	259	292	0	43	249	
"	Test	1980	June	713	203	388	12	0	---	---	---	
"	"	1982	"	505	134	320	18	0	---	---	---	
"	"	1984	"	592	106	315	61	0	---	---	---	
"	"	1985	June	259	33	135	36	0	---	---	---	
"	"	1985	Aug	669	105	217	60	0	---	---	---	
"	"	1986	"	646	345	214	86	0	---	---	---	
"	"	1987	"	428	69	228	69	292	0	226	66	
"	"	1988	"	2,040	2,011	867	798	1,942	337	839	766	
"	"	1989	"	1,993	1,819	429	578	1,624	813	368	443	
Goodpaster River	"	1990	Aug	1,793	1,534	901	296	1,348	339	807	202	
Totals:				May	1,454	100	453	860	1,088	0	347	741
				June	2,069	476	1,158	127	0	0	0	0
				Aug	7,569	5,883	2,856	1,887	5,206	1,489	2,240	1,477
				Total	11,092	6,459	4,467	2,874	6,294	1,489	2,587	2,218
Salcha River	Test	1986	June	174	5	42	127	164	1	41	122	
"	"	1987	"	587	27	283	277	556	9	278	269	
"	"	1988	"	630	88	218	324	617	86	212	319	
"	"	1989	"	1,120	144	571	405	1,091	133	558	400	
Salcha River	Test	1990	June	889	220	422	245	871	216	413	242	
Totals:					3,400	484	1,536	1,378	3,299	445	1,502	1,352

^a Gear type for all sampling was an electrofishing boat.

^b Totals may not equal sum of strata due to missing lengths and/or fish less than minimum length.

Appendix A52. Numbers of grayling in the initial catch and the new marks released from test sampling in the Tanana River at the mouth of Shaw Creek and at Big Delta, 1979 through 1988.

Location	Sample	Year	Period	Catch				Mark Released			
				Total ^a	150-199	200-269	>269	Total ^a	150-199	200-269	>269
Shaw Cr. Mouth	Creel ^b	1981	April	289 (470)	2	68	220	0	---	---	---
"	" ^b	1982	"	377 (384)	0	69	308	0	---	---	---
"	"	1983	"	304	0	26	278	0	---	---	---
"	"	1984	"	364	0	13	351	0	---	---	---
"	"	1985	"	412	0	42	370	0	---	---	---
"	Creel	1986	April	184	0	28	156	0	---	---	---
"	Test	1987	"	270	1	15	254	231	0	15	216
Shaw Cr. Mouth	Test	1988	"	341	10	112	215	297	0	112	185
Total				2,787	13	548	2,223	771	0	299	472
at Big Delta											
"	Creel	1979	April	68	0	44	24	0	---	---	---
"	Test	1980	"	8	0	6	2	8	0	6	2
Total				76	0	50	26	8	0	6	2

^a Totals may not equal sum of strata due to missing lengths and/or fish less than minimum length.

^b In parentheses are total fish enumerated during harvest sampling. Numbers in strata were measured.

Appendix A53. Numbers of grayling in the initial catch and the new marks released from test sampling in Ptarmigan, Buchanan, and Kiana creeks 1983.

Location	Sample	Year	Period	Catch				Mark Released			
				Total ^a	150-199	200-269	>269	Total ^a	150-199	200-269	>269
Ptarmigan Creek	Test	1983	13 Jun	20	0	18	2	20	0	18	2
Buchanan Creek	"	1983	16 Jun	29	2	23	4	27	0	23	4
Kiana Creek	"	1983	30 Jun	27	2	16	9	27	2	16	9

^a Totals may not equal sum of strata due to missing lengths and/or fish less than minimum length.